ESTABLISHED IN 1872

PAPER TRADE JOURNAL

PAPER

SIXTY-FOURTH YEAR

PULP

Established Feb. 17, 1899
Consolidated Nov. 16, 1899
with PAPER TRADE JOURNAL.

Vol. CII, No. 11 Thursday, March 12, 1936

Established Sept. 21, 1910
Consolidated Feb. 19, 1925
with PAPER TRADE JOURNAL.

Abitibi Power & Paper Co.'s Sales Increase

Annual Statement Expected to Show Gain of 50,000 Tons in 1935, Compared With Preceding Year—Manufacturing Operations Were Maintained At 40 Per Cent of Capacity Compared With 34.4 Per Cent in 1934—Company May Be Reorganized in Near Future—Position of Company Improved During 1935

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., March 9, 1936—Abitibi Power and Paper Company's annual statement, soon to go out, is expected to show sales of about 290,000 tons, an increase of about 50,000 tons over 1934. In 1934 the company was operating at about 34.4 per cent of total capacity. Apparently in 1935 this was raised to around 40 per cent of capacity. It is expected that the company's earnings in 1935 on this increased capacity will show about $1,200,000 excess of income over expenses before depreciation or bond interest. In 1934 the total was $953,928, and in 1933 $1,000,000.

It is probable an effort will be made to reorganize the company in the near future. Statements credited to members of the Ontario Government indicate that they would like to see the company taken out of the hands of the receivership. In a reorganization plan protective committees already existing and some perhaps yet to be formed would have to take care of $48,300,000 of series A first mortgage 5 per cent bonds due 1953; $1,000,000 of 7 per cent cumulative preferred $100 par value, $34,900,000 of 6 per cent cumulative preferred of $100 par value, and 1,100,000 no par value common shares.

The company went into receivership June 1, 1932, on failing to make payment of the half-yearly interest coupons maturing on its 5 per cent bonds. Without taking into account depreciation, the present income is not more than half enough for those bonds. Under these circumstances, it is apparent that interest on preferred and common shares would be represented in a reorganization by a drastic cutting down in the number of shares, which would have to take an inferior position to the bonds.

At the end of 1934 current assets were $4,100,000 and current liabilities $4,300,000. The deficiency in working capital was therefore $243,931. It is understood that there has been an improvement in the current position during 1935.

One of the obstacles to reorganization in the past has been the company's various contingent obligations with respect to power contracts with mills now regarded as obsolete. If the Government is able to arrange for cancellation of these contracts, which cannot be made use of, it is possible the revenues of the organization might take quite a jump. Many believe the position of the company from the earnings standpoint would be immediately improved if it could eliminate from its assets the mills that are now idle and are likely to remain idle. From time to time there have been reports of various interests looking at some of these mills to see if they are available for other purposes. There is always the possibility of some sale or exchange made in this way proving of value to the company. At the end of 1934 there was still shown an amount of $2,700,000 owing on purchase of the Thunder Bay Paper Company. For 1936, prospects are regarded as improved. The action of one large producer in setting a price of $1 above the 1935 price of $40 per ton is expected to be adhered to generally.

Moore Company Earnings Up

Net earnings after all charges, equal to $2.18 per share on common, the best since 1929, are reported by the Moore Corporation, Ltd., for the fiscal year ended December 31, 1935. In 1934 net was equal to $1.14 per share, and in 1933 to 27 cents a share. In their accompanying remarks, S. J. Moore, of Toronto, chairman of the board, and E. G. Baker, president, state that the improvement in results for the year is due partly to the better general business conditions, and partly to the successful working out of policies for broader market coverage, improved manufacturing practices and more effective control of all departments. All operating divisions earned satisfactory profits for the year. Prospects for the year 1936 are encouraging, and directors look for continued improvement in the company's business. Announcement is made in the report that directors have declared a dividend of 25 cents per share on the common stock, payable April 1, and propose to pay dividends quarterly at this rate through the ensuing year.

Burke Guest at Hull Banquet

An outline of the objectives and responsibilities of organized labor was given in Hull by John P. Burke, president of the International Brotherhood of Pulp, Sulphite and Paper Mill Workers, speaker at a banquet by the Provincial Council of Paper Mill Unions. Another guest of honor was P. M. Draper, president of the Trades and Labor Congress of Canada. In the course of his address

(Continued on page 22)

New Wagner Labor Relations Law Skirmish

Two Paper Makers Labor Organizations File Petition for Recognition As Bargaining Agents for Employees of Mosinee Paper Mills Co.—Company Argues That Measure Does Not Apply to It Since It Is Not Engaged in Interstate Commerce

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., March 9, 1936—One of the first skirmishes with the newly enacted Wagner labor relations law took place last week at Wausau, Wis., when the regional labor board met representatives of the Mosinee Paper Mills Company, Mosinee, Wis., and of the National Paper Makers' Union, and the Pulp and Sulphite Workers' International Union.

These two labor organizations filed a petition for recognition as bargaining agents for employees of the mill. They requested either a certification to that effect or an election to prove they represented a majority of employees.

Union spokesmen claimed that 90 per cent of all Mosinee employees were members of their craft unions.

The company argued that the Wagner law does not apply to it, since it is not engaged in interstate commerce; also that it need not abide by the act until it is upheld by the supreme court as the law. The company, in addition, disputed the unions' membership claims.

Transcripts of testimony and a report by Robert M. Gage, of Washington, trial examiner, will be sent to the Washington headquarters of the national labor board for consideration.

Paper Specialties More Active

Milwaukee's paper box and other paper specialty industries are showing a marked upturn, according to employment reports of the Wisconsin Industrial Commission. The trend is seen in a comparison of these groups as of January 15, 1932, and January 15, 1936, using identical industries for the compilations. Six box factories showed 1,206 employees on the pay rolls January 15, 1936, as compared with 1,061 on the same date in 1932. Pay rolls increased 67.6 per cent from $16.175 in 1932 to $27,116 in 1936. Six other paper specialty concerns showed 421 employees in 1936, with a pay roll increase of 6.7 per cent from $8,069 in 1932 to $8,609 in 1936.

New Addition for Atlas Mill

A small frame addition costing $4,000 is to be built to the Atlas mill of the Kimberly-Clark Corporation at Appleton, Wis. It will be used for the testing and matching of wall paper, and for a visual comparison of colors. The building will be one-story, 16 by 29 feet. January business of the Atlas mill topped all preceding records by 250,000 rolls of wall paper. The output during the month was 2,000,000 rolls.

Club Car Service Popular

Stocking of larger quantities and a wider variety by jobbers is one of the advantages being enjoyed by the 27 mills pooling their less than carload shipments through the Wisconsin Paper Group, with offices at Menasha, Wis., in charge of Irwin Pearson, executive secretary. Paper merchants are enjoying carload freight rates, quicker turnover, and an increase in percentage of profits.

Club car service is becoming more and more popular. Mills all report their less than carload shipments to the Group offices, and all orders for one city or locality are shipped in carloads consigned to a warehouse or trucking company and then redistributed to the individual jobbers. The car is moved as soon as sufficient tonnage is booked to reach the minimum weight. This service is highly favorable to merchants who cannot take advantage of the regular pool car service, in which orders placed with several mills for a number of varieties are assembled in one car and consigned to one jobber at carload rates.

In order to assure fast turnover on minimum inventories, the pool has been able to speed deliveries so as to provide fourth morning delivery in New York and seventh morning delivery on the Pacific coast. By keeping a daily record of movement of cars, the Group has been able to issue a "dated car" schedule to merchants and member mills. The manufacturer and merchant know just when a shipment can be got to market, and Wisconsin mills thus have been able to compete with products made closer to the market.

Officers of the group are: M. T. Ray, Thilmany Pulp and Paper Company, president; Leo E. Croy, Menasha Products Company, vice-president; L. O. Schubart, Neenah Paper Company, secretary-treasurer, and Irwin Pearson, executive secretary. The 27 mills in the membership manufacture 160 grades of paper and a choice of 250 celebrated mill brands in all sizes, weights, colors and finishes. Practically any type of paper made is obtainable in the Wisconsin Paper Group.

George F. Newton, of Iron Mountain, Mich., who hopes to purchase the controlling interest in the Northern Paper Mills, Green Bay, Wis., revealed some of his plans in a recent interview. He has an option on the shares of stock owned by the Patten Paper Company, Ltd., Appleton, Wis., and Mr. and Mrs. Judson G. Rosebush, who are protected by an injunction in delivering the control if an appeal now pending in the United States Court sustains the decision of Judge F. A. Geiger of Milwaukee in connection with the reorganization of the Patten company under section 77B of the federal bankruptcy laws.

Mr. Newton declines to name the Chicago syndicate he represents through whom the financing for the purchase will be done, but said it does not include any paper mill men or competing companies. No changes in operation or operating personnel therefore are contemplated, he said.

Mr. Newton also denied that the deal was an attempt to restore Mr. Rosebush, former vice-president and general manager, to control, although he said "Mr. Rosebush's knowledge of the mill and its affairs will be put to use in some way." His group, he said, is interested only in the mill as an investment, and commands sufficient capital not only to purchase control of the stock, but also to make other advances he claims are needed now or will be in the near future.

"We believe in the possibilities of the plant, its future and its prospects," said Mr. Newton. "It made a good record during the depression, kept up employment and met its obligations, which is more than many concerns did. Its waterfront location, with possibilities for bringing in coal and pulp, are especially desirable. It is our hope to continue operation on an increasing and expanding basis."

Paper mills doing extensive shipping by truck will benefit from an order issued by the Wisconsin Public Service Commission last week reducing class freight rates for Wisconsin common carrier trucks nearly 10 per cent, effective April 1. The new rates are classified according to the official railroad classification. They range from 25 cents for a 5-mile haul of 100 pounds to 31 cents for 25 miles, and on a varying scale up to $1.35 for 400 miles. A decision is still pending on a request of motor carriers to make a 5 per cent refund to shippers or consignees who handle their own pickup and delivery service, as is done with the railroads.

A loan of $300 has been made by the city council of Kaukauna, Wis., to the bondholders' committee of the Outagamie Paper Company to employ three watchmen for a period of sixty days. The mill is idle, not protected by insurance or from vandals, and was cited as a fire hazard to adjoining property. The committee is seeking a buyer for the mill, but lacked funds for its protection until a deal can be negotiated.

Motion pictures showing the numerous processes in paper making were shown by R. A. Schmid of the Kimberly-Clark Corporation at a meeting of the Rotary Club at Appleton, Wis., last week. Mr. Schmid also explained the importance and extent of the industry in the United States.

Fire and dense smoke caused several hundreds dollars in damage at the Consumers Waste and Paper Company, Milwaukee, Wis. The blaze started on the second floor at 8:30 in the evening, but was controlled by the sprinkler system.

Burt Elwood Ashman, administrative assistant at the Institute of Paper Chemistry, Appleton, Wis., and Miss Gwendolyn Johnson of Wauwatosa, Wis., were married last week at the home of the bride's parents. They will reside in Appleton.

Champion Employees To Present Show

[FROM OUR REGULAR CORRESPONDENT]

DAYTON, Ohio, March 9, 1936—Employees of the Champion Paper and Fibre Company will present their second annual show for five nights, beginning April 2, under auspices of the Champion employees' council. It is to be a brilliant, musical-mystery comedy, entitled: "Step This Way," with a greater cast than in their show of last year, which was a tremendous success.

Jack Kress, of the John B. Rogers Producing company, will arrive in Hamilton Tuesday afternoon and will begin selecting his cast from employees Tuesday evening. Mr. Kress rehearsed and produced the "Champion Frolics of 1935" with such excellent results that the committee would consider no one else for coach of this year's production. All employees interested in the show will gather in the rehearsal room of the coating mill Tuesday evening, when the script of the play will be read and the talent selected.

There are 104 parts to be taken, with six leading female roles, seven leading male roles and a number of minor speaking parts.

An outstanding feature of the show will be a singing and dancing male chorus. There also will be a number of girls' choruses, both singing and dancing.

The show, written by Walter Stone, author of musical comedy successes, has a number of tuneful numbers and a clever story. The story is augmented by a strong mystery element, a part of the plot. Extremely modern and original dances are featured.

Calvin Skillman is general chairman of the show committee.

Price Bros. Ownership Fight

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., March 10, 1936—The air here is full of rumblings of what is said to be another battle brewing for the ownership of the great pulp and paper and lumbering firm of Price Brothers & Co. The position is this: The Bondholders Protective Committee has accepted, with slight modifications, the plan put forward by a new company called Pacona, representing Aluminum Ltd. and Lehman Bros., by which that company would pay approximately $20,000,000 for the company's assets. Of this amount about $13,700,000 would go to the bondholders in full settlement of their claims. An amount of around $1,700,000 is set aside for the assets held by the Hon. Gordon Scott, as trustee-in-bankruptcy, while the balance would cover the bank and other unsecured claims.

Nothing would be available for the common or preferred shareholders, and there's the rub.

Under previous offers, all rejected, the preferred and common shareholders were scheduled to receive an equity in the company when reorganized, and they still feel they ought to do so.

A competitive offer has to be put forward if the sale of the company's assets is to be forestalled, and it is now said that not one but several competitive offers are in the making.

Lord Beaverbrook, of the *London Daily Express*, came out to Canada some time ago and made an unsuccessful effort to put the company on its feet. He is interested both as a shareholder and as one of the company's principal newsprint customers, and there is an idea that he may again come forward with a plan to reorganize the company.

Bowaters Paper Mills, one of the largest newsprint producers in England, has made several offers for the company. It has the resources necessary to put the company on its feet, and it can throw a lot of newsprint orders in the way of the Canadian company. Bowaters is expected to make another offer.

A Canadian company and a New York banking house are said to be possible bidders also.

Such in brief is how matters stand at present. This time interests are really hopeful that out of the competitive bidding something tangible and constructive will result.

TAPPI Summer Meeting

In response to a number of inquiries the Technical Association of the Pulp and Paper Industry wishes to announce that the only national meeting that it will hold during the balance of 1936 will be the International Meeting of the Technical Association with the Technical Section of the Canadian Pulp and Paper Association from August 3 to 7. Since the Association has usually held its regional meeting later in the fall, there has been an impression that the summer meeting as previously announced would be followed by a later meeting.

In view of the expected popularity of the summer meeting all those who intend to attend the meeting and take the Saguenay cruise should make reservations immediately with L. S. Tobin of Economical Tours, Ltd., 1409 Peel street, Montreal, P. Q. More than 150 individuals have already made reservation. The best staterooms will be assigned to those making earlier reservations. For those who later find that they cannot take the trip a refund of the travel deposit of $25 will be returned. The rooms now available are the double berth staterooms at $52 and $54 (including registration fee). The latter will probably all be reserved within the next few weeks. It is evident that the entire boat will be reserved before the middle of April.

Chicago Paper Business Continues to Improve

Demand for Various Grades of Fine Paper Well Sustained—Book Paper Displays Stronger Undertone—Kraft Wrapping Paper Remains Firm—Outlook for Paper Board Market Encouraging—Waste Paper Collections Speeded Up

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., March 9, 1936—More seasonal weather permitted local retail outlets to rapidly diminish stock on hand and pave the way for current Spring and early Summer buying, which is helping the Chicago market. Prices are for the most part remaining firm, while the majority of the mill representatives here report mills as running at a comparatively favorable rate of production. An uneasy feeling pertaining to one or two lines is said to be diminishing as time goes on with these particular markets holding firm. Some well directed efforts have obviously continued to get results.

The kraft market continues firm here, fortified by strength in the pulp market itself. Books and covers have some improvement credited for them during the week with the former indicating a particularly improved tone. Fine papers are little changed, with only slight deviations reported in certain of the bond lines and the entire market holding well. Groundwoods maintained a forward tone during the week, while newsprint representatives indicated little change in that market. The board market was more firm with local financial reports showing an encouraging pace of business. Waste papers lost a little of their strength as better weather speeded up waste paper collections.

Several news sources in the city of Chicago have taken the action of the Container Corporation of America in deferring payment of dividends despite comparatively large earnings in 1935 to mean that the company is planning either the acquisition or the costruction of a kraft pulp and paper plant in the near future. An official announcement from Walter P. Paepcke read that the dividend action was not taken because of "a very important project under consideration which holds interesting profit possibilities and further insures the company's future but which requires a financial investment." This action was taken in the face of 1935 earnings of $1.89 per share on present outstanding capital stock, a total of $1,238,009, as compared to earnings of $1,112,711 in 1934.

Reports in the *Chicago Journal of Commerce*, local financial newspaper, say that the earnings are to be partly spent, at least, for the new kraft mill, which may be purchased at advantageous terms. The announcement concerning full details is expected within the next two weeks. If an agreement cannot be reached on the proposed and reported new acquisition it is expected that the directors would consider payment of a dividend the latter part of the month.

The earnings of the Container Corporation of America contained a number of unusual points, including the gaining a large increase in earnings despite the fact that there was $168,000 more allowed for depreciation than in 1934. The 1935 earnings also assumed significance as they were improved in each quarter with the improvement continuing on into the final quarter of the year, where ordinarily it might have slumped off during the final period.

Wood Pulp Fought Rates

It is reported that a number of water carriers have evidenced an intention to publish a rate of 20 cents per 100 pounds on imported wood pulp from Gulf Ports to Alton, East St. Louis and St. Louis, rates based on an 80,000 pound minimum. The present rate is 22½ cents and the action of the carriers is reported to follow failure to secure official approval of the 20-cent rate.

Illinois shippers are also interested in the submission by the Southern Ports committee of a petition to the interstate commerce commission asking for an extension of thirty days to file revised rates affecting traffic between the Gulf Ports and Interior Ports on the east of the Mississippi River and on the Chicago-Indianapolis-Cincinnati line. The thirty-day extension is asked as necessary in completing the rate check made necessary by the recent minimum earnings requirements set down in commission decisions.

News of the Industry

An effort to popularize the completeness of the Strathmore bond line is made this week by the Swigart Paper Company, local distributors. A special mailing headed: "One Salesman; One Phone Number; One Price Book; One Paper House" contains the information that Highway Bond, Bay Path Bond and Strathmore Deed have been added to the Swigart line "making now available all grades in all weights in all Strathmore bond papers." Swigart also features the complete Hammermill line to round out its request that the trade "save valuable time with one complete fast service."

Link-Belt Exhibit Attracts

The stoker department of the Link-Belt Company, Chicago, was host to prominent heating executives at a three-day preview, February 25 to 27, of the Link-Belt exposition of automatic firing. The exposition is a permanent display fronting on Michigan Boulevard, decorated in the modern mode with a novel color scheme. One display shows a new 1936 model Link-Belt stoker under fire while another interesting feature of the exhibition is a new automatic air control, shown in operation on the air duct of the stoker under fire. This control, now being announced by Link-Belt after extensive field tests, is said to be entirely different from anything in its line. Stoker officials claim its use will cut down stoker service calls by 50 to 75 per cent by eliminating the necessity for changing air adjustments to suit varying combustion characteristics.

Mohawk Paper Mills Changes

COHOES, N Y., March 9, 1936—William J. Gaul has become connected with the Mohawk Paper Mills, Inc., as assistant superintendent of the company's Waterford paper mill. Mr. Gaul was last with the Hampshire Paper Company, and prior to that with the Reading Paper Mills.

The company also announces that Richard H. Ashby, formerly with the Standard Paper Manufacturing Company, of Richmond, Va., has joined its sales organization as Philadelphia manager. The new office of the company in Philadelphia is in the Lincoln-Liberty Building, Broad and Chestnut streets.

William E. Sullivan, formerly with the groveton Paper Company and the American Writing Paper Company, it was announced, has joined the sales organization of the company. Mr. Sullivan will cover the Western New England territory and will also handle direct mail advertising for the mills.

Philadelphia Paper Industry Displays Strength

Upward Trend in Local Paper Market Experienced During Last Several Months Generally Well Maintained—J. R. Howarth, of the J. R. Howarth Paper Co., Discusses Association Work At Meeting of Paper and Cordage Association of Philadelphia

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., March 9, 1936—With the advent of the opening of the last month in the first quarter of the present year, the paper trade here believes it is facing a continuance of the upward trend which has been maintaining in this area over a period of months.

Generally speaking, business in the waste paper industry seems to be improving, more especially is this true of kraft paper and corrugated board. On account of weather conditions in this territory, collections have been more or less curtailed but the mills have been using all available stock. However, while it is true that accumulation is less and demand is better, prices are not lifting, although they are holding very firm.

Association Activities

A meeting of the Fine Paper Division of the Paper Trade Association of Philadelphia will be held at the Down Town Club at 12 noon, Monday, March 16. Ormand Freile will preside.

A 6 o'clock dinner meeting at Bookbinders is scheduled for Thursday of this week by the Coarse Paper Division of the Association. T. H. B. Smythe, vice-president, will preside. It is expected that Nathaniel Saxe, who was delegate for this Division to the National Paper Trade Association convention, will make his report.

At the recent meeting of the Paper and Cordage Association of Philadelphia, held in Adelphia Hotel, the following firms were entered into membership: The Paper House of Pennsylvania, represented by Norbert A. Considine; The Paper Merchants, Inc., represented by Ormand Freile; Lily Cup and Specialty Company, represented by H. H. Mann; Continental Paper and Bag Company, represented by R. Niswander; Whiting Paper Company, represented by LeRoy Phaup, and St. Regis Paper Company, represented by Ira Reynolds. With the above, the membership of the Association now totals ninety.

At this same meeting, J. R. Howarth of the J. R. Howarth Paper Company, spoke as follows:

"As far as I can learn, the purpose of all associations is to improve business conditions.

"Take our great National Paper Trade Association with all the local associations throughout the United States. *Think*, what a wonderful force this is for your benefit and my benefit in improving business conditions.

"While the Philadelphia Paper and Cordage Association is more on the social side, yet at the same time it is automatically improving business conditions through its friendly, congenial and social activities. Therefore, in order to bring the members still closer together so they may know what house each member represents and the complete line he sells it was decided to have each member send in one hundred of his letterheads with an itemized list of what he sells, and thus this book which I have before me was inaugurated. In this way, it is a very easy matter to leaf through this book and see at a glance if you can place an order with a fellow member, as we all know it would be highly impossible to look through seventy or eighty individual catalogs.

"And again, with the same friendly spirit and the thought of doing good, or shall I say giving a fellow member an order, rather than trying to get one, our members have only to look at this neatly compiled book and therein they will find at a glance letterheads containing the firm name and detailed listings of their stock in trade, and presto! the order is on its way.

"I personally have placed this book with our purchasing agent with the understanding that whenever possible, he was to buy from the members of the Philadelphia Paper and Cordage Association, and I am happy to say, not including the American Writing Paper Company, which is our main source of supply, or other mills not represented here, for the year 1935 our company has placed more than $60,000 worth of business with the Philadelphia Paper and Cordage Association members.

"A total of forty-two members received this business, which formerly was placed outside the association, and quite often with strangers. This business was not solicited by members. We called them on the 'phone, gave them our order, and got a great kick in doing this work.

"Bonds and Ledger Papers, book and kraft paper, blueprint paper, index bristols, binder boards, gummed paper, paper cups, towels and toilet tissues, envelopes of all kinds, also brooms, mops and buckets, meat skewers, step ladders, etc., were included in these orders.

"Let me leave this thought with you. There is no mercenary thought in back of this program—in fact it is just the opposite. And if each member will adopt these ideals, this association is rich in the many opportunities it has to offer all of us."

The 31st annual banquet of the Philadelphia Waste Merchants Association was held in the Crystal Room of Adelphia Hotel on Tuesday, February 25. Upwards of two hundred and twenty-five guests were in attendance. James M. O'Neill, president of the association, presided.

Howard W. Taylor Dead

Howard W. Taylor, president of W. C. Hamilton and Sons, paper manufacturers, died on Saturday last, at his home 6017 Greene street, Germantown, of pneumonia. He was 62 years old.

Born in Philadelphia, he belonged to an old Quaker family. Previous to becoming associated with W. C. Hamilton and Sons, he was vice-president of Dill & Collins. For many years he served on the Board of Managers of Friends' Hospital and he was also a member of the Union League.

He is survived by his widow, Mrs. Alice Lane Taylor, a daughter, Mrs. John Learned, of South Manchester, Conn., and two sons, Lane Taylor and Howard W. Taylor, Jr., of this city.

American Writing Paper Plan

S. L. Willson, president of the American Writing Paper Company, Inc., has sent a letter to the company's creditors and stockholders asking for approval of the plan of reorganization dated December 30 and approved in form by the Federal Court in Massachusetts. The deposit of securities is not necessary, the letter states, since the court has approved forms of acceptances which can be filled in, verified and sent in to the secretary of the company.

Demand for Paper Quiet to Fair in Boston

Volume of Sales of Fine and Coarse Papers Ahead of Anticipated Quota Since Beginning of Year—Box Board Continues Dull, With Quotations Practically Unchanged—Paper Stock Market Generally Firm—Domestic Rags Remain Steady

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., March 9, 1936.—Business of wholesale paper dealers in Boston and vicinity was quiet to fair, as a whole, during the last week. At least one fine paper house, however, notes that business was "pretty good, after a quiet February." At another house business was ahead of the anticipated quota since the first of the year. A dealer in wrapping paper and specialties says that the volume was 20 to 25 per cent ahead of a year ago, but that the profit was not so good. Box board continued quiet, without much change in prices and without "much excitement."

The paper stock market continued generally firm. The volume of material moved was reported as not so great as it had been, but prices remained stable, generally. There were two declines and three advances throughout the list. Under old papers, the demand for old newspapers increased, so that with diminished collections, due to weather conditions, the price advanced to .32½@.35 from .27½@.30. Mixed papers remained at the same levels, with a good demand prevailing. Manila envelope cuttings declined to 1.50@1.60 from 1.60@1.70.

Some grades of bagging tended to be somewhat easier, but there has been such a demand for roofing bagging, such as foreign and domestic scrap burlap that the price has steadied. Bleachery burlap rose to 4.50@5.00 from 4.00@4.50. Australian wool pouches went down to 3.00@3.15 from 3.15@3.30. New and old domestic rags remained steady. In foreign rags, dark cottons advanced to 2.15@2.35 from 2.00@2.25.

The demand for twine was slow. Twine has been slowly declining in price, on account of the removal of the processing tax.

Fiftieth Anniversary Banquet

A noteworthy occasion in the trade here will be the Fiftieth Anniversary Banquet of the Boston Paper Trade Association to be held at the Algonquin Club March 18, at the annual meeting of the organization. A larger attendance than usual is expected. The banquet will be at 6:30 o'clock, preceded by a reception at 6 o'clock. An anniversary brochure, inscribed with the name of the member to whom it is presented, is to be given out. The brochure contains a foreword by President Frederic W. Main, a brief history of the association by Col. Charles S. Proctor, pictures of twenty-five past-presidents, the by-laws and a full list of the past officers from the beginning of the association.

The guest speaker will be Robert Lincoln O'Brien, chairman of the United States Tariff Commission, formerly editor of the *Boston Herald*. Mr. O'Brien's topic will be "The Present Trend in National Legislation."

Applications for membership include the following: Regular—L. J. Parant, St. Croix Paper Company, of Woodland, Me., proposed by Arthur L. Hobson; Horace S. Proctor, Proctor Paper Company, of Lowell, Mass., proposed by Col. Charles S. Proctor. Limited—Harold Hinckley, St. Croix Paper Company, of Boston, proposed by Arthur L. Hobson.

The reception committee is composed of past presidents: John E. A. Hussey, chairman, Nelson Curtis, Arthur L. Hobson, Col. Charles S. Proctor, Charles L. Baird, Mark H. Warren, Herbert W. Mason, John A. Andrew, Norman Harrower, Hubert L. Carter, Albert R. Smith and Charles A. Esty.

Officers of the association for 1935-1936 are: President, Frederic W. Main; 1st vice-president, F. Bendel Tracy; 2d vice-president, W. J. Raybold; treasurer, T. Charles Casey, secretary, John L. Hobson.

News of the Industry

An attractive revolving display in the window of the office of the Arnold-Roberts Company, 58 High street, showing Westvaco Inspirations Paper, demonstrates with illustrations the use of colors on this paper. The display includes two cylinders, the lower one about two feet in diameter and one and one-half feet high and the upper one about one foot in diameter and one and one-half feet high. The background is of gilt.

The Marvellum Company, Holyoke, Mass., of which Henry L. Goodman is a New England representative, has issued Book No. A-1, containing a swatch of Quadrille Silvergloss Papers. These papers are in white, light blue, lavender, pink, buff, light green, dark green, dark blue, red and black.

Percy D. Wells is renovating his store at 58 Pearl street, making a new office and enlarging the stockroom.

Charles A. Esty, president of Carter, Rice & Co., Corp., left Thursday for a visit to the Pacific Coast branches of the company, San Francisco, Cal.; Seattle, Wash., and Portland, Ore. He was accompanied by Mrs. Esty and went by boat.

W. A. Welsh, of the Welsh Paper Company, Philadelphia, Pa., was in Boston Thursday, passing the day with Henry L. Goodman, with whom he talked over some new lines of box and greeting card papers.

L. S. Wright, sales promotion manager of Bird & Son, East Walpole, Mass., will be the principal speaker at the luncheon meeting of the Advertising Club of Boston, at the Hotel Statler, Tuesday.

J. P. Prescott Joins Brokerage House

[FROM OUR REGULAR CORRESPONDENT]

HOLYOKE, Mass., March 10, 1936—Joseph P. Prescott, who resigned a few weeks ago as treasurer of the Collins Paper Manufacturing Company of North Wilbraham, is to become representative on the New York Stock Exchange of Tiff Brothers, Springfield brokerage house.

In going to New York, Mr. Prescott goes back to one of his early loves, as he was with Paine Webber & Co. of Springfield, leaving that concern in 1928 to join the Collins Company. On the death of the late Samuel Raynor Whiting two years ago he became treasurer. He was also executor of the Whiting estate.

Mrs. Prescott's great grandfather was one of the pioneer paper manufacturer's here and was interested in the founding of the Parsons Paper Company. His grandfather, the late Charles B. Prescott was interested in the development of the Valley Paper Company.

Paper and Pulp Imports of the United States

For Dec. and for the Twelve Months Ending Dec. 31, 1935 and 1934

PAPER IMPORTS

Articles	December, 1935 Quantity	December, 1935 Dollars	Twelve Months, Ending December, 1935 Quantity	Twelve Months, Ending December, 1935 Dollars
PAPER AND MANUFACTURERS	.....	9,409,548	.....	93,443,916
Printing paper—				
Standard news print, free	499,751	8,464,391	4,766,631	82,265,267
Other, dut.	1,585,219	34,413	11,560,208	246,467
Grease and waterproof, dut.	58,183	11,300	594,128	122,003
Kraft wrapping, dut.	3,488,872	115,856	24,726,308	817,347
Other wrapping, dut.	209,241	8,642	1,085,986	42,557
Writing and drawing, dut.	146,146	31,742	1,248,949	295,604
Paper and envelope combinations, dut.	.....	1,417	.....	26,393
Surface coated, dut.	172,262	58,893	1,806,788	593,262
Uncoated, decorated, embossed, dut.	1,229	607	38,062	16,120
Tissue and similar paper:				
Not over 6 pounds to the ream, dut.	89,527	36,580	1,169,405	562,164
Other, dut.	38,910	15,990	589,404	235,744
Pulpboard, in rolls, dut.	70,455	1,113	16,716,211	288,227
Paperboard, pulpboard, n.e.s., and cardboard, dut.	2,924,577	45,109	17,370,796	285,098
Leatherboard, test, and wallboard, dut.	2,106,958	54,569	15,199,326	457,637
Cigarette paper:				
Flat or in bobbins, dut.	926,711	243,024	13,150,303	3,290,784
Books and book covers, dut.	101,918	32,614	2,166,506	709,488
Hanging paper (wall paper), dut.	78,864	18,735	363,784	123,689
Duplex, decalcomania, not printed, free	32,451	6,594	460,902	98,177
Paper boxes, dut.	.....	36,325	.....	434,061
Papier mâché and pulp manufacturers, dut.	.....	17,310	.....	324,173
Other paper and manufactures, dut.	.....	174,324	.....	2,209,654

PAPER BASE STOCK IMPORTS

Articles	December, 1935 Quantity	December, 1935 Dollars	Twelve Months, Ending December, 1935 Quantity	Twelve Months, Ending December, 1935 Dollars
PAPER BASE STOCKS	.....	9,378,447	.....	82,043,697
Pulpwood cords	62,867	418,251	1,037,332	7,760,700
Rough:				
Spruce, free cords	4,155	32,448	83,054	669,417
Other, free cords	7,380	44,136	16,605	88,681
Peeled:				
Spruce, free cords	37,840	267,439	748,011	6,013,576
Other, free cords	13,492	74,228	189,237	986,667
Rossed:				
Spruce, free cords	.....	.....	374	2,104
Other, free cords	.....	.....	51	255
Wood and other pulp: (Ton = 2,000 pounds, air-dry weight)				
Mechanically ground wood pulp:				
Unbleached, free tons	23,913	380,736	172,203	2,980,955
Bleached, free tons	1,191	22,070	17,838	296,430
Sulphite wood pulp:				
Unbleached, free tons	93,537	3,200,115	693,026	24,026,390
Bleached, free tons	44,200	2,228,487	429,424	21,934,054
Sulphate wood pulp:				
Unbleached (Kraft), free tons	70,372	2,108,532	526,684	15,893,593
Bleached, free tons	8,946	511,754	84,658	5,193,789
Soda pulp, free tons	675	30,261	9,416	409,636
Other pulp, free tons	.....	54	394	26,074
Rags for paper stock, free lbs.	26,169,843	342,632	201,310,993	2,411,424
All other paper stock, free lbs.	9,094,574	135,555	77,800,892	1,110,652

PAPER IMPORTS

Articles	December, 1934 Quantity	December, 1934 Dollars	Twelve Months, Ending December, 1934 Quantity	Twelve Months, Ending December, 1934 Dollars
PAPER AND MANUFACTURERS	.....	8,307,866	.....	86,518,680
Printing paper—				
Standard news print, free	445,794	7,582,297	4,419,396	76,271,527
Other, n.e.s., dut.	703,952	15,207	7,799,950	167,897
Grease and waterproof, dut.	36,373	6,849	346,231	78,232
Kraft wrapping, dut.	670,284	23,767	8,052,950	297,909
Other wrapping, dut.	13,558	1,250	1,602,658	59,417
Writing and drawing, dut.	105,276	24,014	1,635,370	359,524
Paper and envelope combinations, dut.	.....	1,133	.....	23,633
Surfaced-coated, dut.	104,802	39,223	1,634,656	612,465
Uncoated, decorated, embossed, dut.	4,110	930	26,718	10,091
Tissue and similar paper:				
Not over 6 pounds to the ream, dut.	96,657	52,637	1,091,594	534,790
Other, dut.	30,215	13,528	507,263	224,457
Pulpboard, in rolls, dut.	1,403,806	24,871	18,184,482	317,627
Paper board, pulpboard, n.e.s., and cardboard, dut.	1,384,461	21,611	15,594,084	269,854
Leatherboard, test, and wallboard, dut.	1,616,661	46,033	7,219,306	239,952
Cigarette paper, books and covers, dut.	936,181	247,579	15,774,318	4,122,578
Hanging paper (wallpaper), dut.	50,003	14,498	248,274	95,286
Duplex, decalcomania, not printed, free	31,884	6,963	441,903	94,381
Paper boxes, dut.	.....	37,186	.....	634,460
Papier mâché and pulp manufactures, dut.	.....	15,723	.....	341,245
Other paper and manufactures, dut.	.....	132,567	.....	1,763,355

PAPER BASE STOCK IMPORTS

Articles	December, 1934 Quantity	December, 1934 Dollars	Twelve Months, Ending December, 1934 Quantity	Twelve Months, Ending December, 1934 Dollars
PAPER BASE STOCKS	.....	5,733,981	.....	71,209,410
Pulpwood cords	42,192	257,951	971,190	7,322,856
Rough:				
Spruce, free cords	1,291	10,296	168,974	1,232,400
Other, free cords	.....	.....	15,643	85,140
Peeled:				
Spruce, free cords	30,254	201,357	668,424	5,359,726
Other, free cords	10,626	46,161	113,412	610,569
Rossed:				
Spruce, free cords	21	137	4,737	35,021
Wood and other pulp: (Ton = 2,000 pounds, air-dry weight)				
Mechanically ground wood pulp:				
Unbleached, free tons	15,597	316,994	159,331	3,020,850
Bleached, free tons	430	9,670	9,753	224,200
Sulphite wood pulp:				
Unbleached, free tons	54,037	2,050,812	603,117	2,179,584
Bleached, free tons	22,843	1,281,448	355,484	19,415,304
Sulphate, wood pulp:				
Unbleached (Kraft), free tons	42,022	1,393,147	429,853	13,773,776
Bleached, free tons	4,734	314,919	48,275	3,334,713
Soda pulp, free tons	706	31,317	6,665	304,660
Other pulp, free tons	5	1,041	137	25,182
Rags for paper stock, free lbs.	4,680,671	39,156	101,523,797	1,282,668
All other paper stock, free lbs.	3,371,387	37,526	52,524,939	753,617

William C. Barney Dead

William C. Barney, aged 71, secretary of the Union Paper and Twine Company and in the paper manufacturing business here since his youth, died recently at his home, 10322 Colonial avenue N. E., Cleveland, Ohio, of a heart ailment. His heart condition was aggravated by shock from a fall December 11.

Dr. William Raymond Barney, one of three sons who are physicians, attended his father.

Mr. Barney was in his early twenties when he became assistant to his father, William I. Barney, then superintendent of the Valley Paper Mill in the Flats.

He married Miss Amanthis Dennis in 1885. They celebrated their golden wedding anniversary last November. For the last 35 years Mr. Barney had been with the Union Paper and Twine Company and was active until he fell, breaking his left foot.

Surviving him are his wife and sons, Dr. William R., professor of obstetrics at Lakeside Hospital; Dr. Robert E., department of dermatology, St. Luke's Hospital; Dr. Burton F., head of the department of dermatology, University Hospital, Ann Arbor, Mich., and Elmer S., 10322 Colonial avenue; and a daughter, Mrs. Margaret B. Miller, Massena, N. Y. Also surviving Mr. Barney are two sisters, Mrs. Flora B. Farr, 2845 Drummond road, Shaker Heights, and Mrs. Fannie B. Piwonka, 19811 Sussex road, Shaker Heights, and a brother, Fred Barney.

Paper and Pulp Exports of the United States

For Dec. and for the Twelve Months Ending Dec. 31, 1935 and 1934

PAPER EXPORTS

Articles	December, 1935 Quantity	December, 1935 Dollars	Twelve Months, Ending December, 1935 Quantity	Twelve Months, Ending December, 1935 Dollars
PAPER AND MANUFACTURERS	.....	1,663,985	.....	20,519,550
Printing paper:				
News print paper.....lbs.	2,758,855	48,276	45,044,940	861,333
Book paper, not coated..lbs.	1,413,347	75,958	19,912,552	1,026,634
Cover paper.....lbs.	72,062	10,888	1,399,500	176,904
Greaseproof and waterproof paper .....lbs.	419,058	101,278	5,856,717	1,137,661
Overissue and old newspapers .....lbs.	15,789,081	98,551	166,398,277	1,121,726
Wrapping paper.....lbs.	4,248,296	188,560	39,229,055	1,882,504
Surface-coated paper.....lbs.	338,666	42,130	7,959,194	843,426
Tissue and crepe papers....lbs.	147,797	28,880	4,754,526	588,675
Toilet paper.....lbs.	703,860	49,978	8,283,260	657,703
Paper towels and napkins..lbs.	295,896	26,348	2,475,815	236,819
Boxboard (paper board and strawboard) .....lbs.	4,106,329	86,363	52,681,922	1,135,396
Bristols and bristol board..lbs.	226,811	15,549	2,294,378	140,669
Other paper board.....lbs.	2,108,688	72,298	25,400,443	1,037,199
Sheathing and building paper .....lbs.	309,884	11,812	8,436,688	259,776
Fiber insulating board or bat .....sq. ft.	2,731,277	80,448	43,885,992	1,269,005
Wall board of paper or pulp .....sq. ft.	956,706	27,562	11,905,414	301,243
Blotting paper.....lbs.	146,143	17,121	1,993,228	202,461
Filing folders, index cards, and other office forms.....lbs.	75,355	22,180	869,282	290,116
Papeteries (fancy writing paper) .....lb.	23,187	4,528	249,371	56,072
Other writing paper.....lbs.	2,476,223	174,212	24,492,613	1,652,857
Paper hangings (wall paper) .....rolls	18,563	2,524	1,002,374	105,731
Paper bags.....lbs.	1,033,576	59,031	13,682,174	753,310
Boxes and cartons.....lbs.	1,047,260	53,950	10,893,574	656,864
Envelopes .....lbs.	49,156	9,863	855,590	143,734
Vulcanized fiber sheets, strips, rods, and tubes.....lbs.	320,254	96,709	3,676,972	1,005,864
Cash-register and adding-machine paper.....lbs.	320,974	24,836	3,483,319	261,954
Other paper and paper products	.....	234,152	.....	2,713,914

PAPER BASE STOCK EXPORTS

Articles	December, 1935 Quantity	December, 1935 Dollars	Twelve Months, Ending December, 1935 Quantity	Twelve Months, Ending December, 1935 Dollars
PAPER BASE STOCKS	.....	1,309,316	.....	9,890,499
Pulpwoods .....cords	309	1,854	29,267	181,807
Wood pulp:				
Sulphite wood pulp.....tons	20,922	1,171,827	148,586	8,347,968
Soda wood pulp.....tons	437	25,422	1,899	104,932
Other wood pulp.....tons	142	9,098	2,828	180,071
Rags and other paper stock..lbs.	4,953,346	101,115	61,085,153	1,075,721

PAPER EXPORTS

Articles	December, 1934 Quantity	December, 1934 Dollars	Twelve Months, Ending December, 1934 Quantity	Twelve Months, Ending December, 1934 Dollars
PAPER AND MANUFACTURERS	.....	1,520,371	.....	18,877,850
Printing paper—				
News print paper.....lbs.	5,216,732	99,745	46,855,378	977,341
Book paper, not coated..lbs.	1,602,637	88,614	16,974,612	911,024
Cover paper.....lbs.	67,781	9,879	948,388	132,887
Greaseproof and waterproof paper .....lbs.	431,274	72,593	4,691,436	881,936
Overissue and old newspapers .....lbs.	17,523,333	121,490	188,304,729	1,581,370
Wrapping paper.....lbs.	3,369,858	143,509	46,169,444	1,957,283
Surface-coated paper.....lbs.	445,689	49,910	7,157,076	776,134
Tissue and crepe paper....lbs.	303,495	32,667	4,802,569	631,536
Toilet paper.....lbs.	611,529	52,251	7,411,241	599,605
Paper towels and napkins..lbs.	244,225	23,117	2,347,550	227,767
Boxboard (paper board and strawboard) .....lbs.	5,006,893	71,960	46,886,422	952,209
Bristols and bristol board..lbs.	166,901	11,853	1,963,401	130,370
Other paper board.....lbs.	2,764,495	83,314	21,112,154	800,428
Sheathing and building paper .....lbs.	546,710	16,257	7,769,904	220,174
Fiber insulating board or bat .....sq. ft.	2,451,777	72,578	34,039,019	981,534
Wall board of paper or pulp .....sq. ft.	1,298,820	30,586	10,119,296	276,490
Blotting paper.....lbs.	153,696	16,473	1,876,637	184,980
Filing folders, index cards, and other office forms.....lbs.	80,786	26,135	872,976	304,174
Papeteries (fancy writing paper) .....lbs.	21,906	4,957	186,450	45,217
Other writing paper.....lbs.	1,760,292	110,752	18,513,617	1,264,961
Paper hangings (wall paper) .....roll	104,945	7,261	800,458	89,465
Paper bags.....lbs.	1,346,972	69,569	13,457,080	744,289
Boxes and cartons.....lbs.	557,249	47,313	9,763,493	633,576
Envelopes .....lbs.	71,071	12,792	877,449	146,362
Vulcanized fiber sheets, strips, rods, and tubes.....lbs.	221,171	60,138	3,546,066	951,159
Cash-register and adding-machine paper.....lbs.	207,178	14,312	3,196,172	246,298
Other paper and paper products	.....	170,346	.....	2,229,281

PAPER BASE STOCK EXPORTS

Articles	December, 1934 Quantity	December, 1934 Dollars	Twelve Months, Ending December, 1934 Quantity	Twelve Months, Ending December, 1934 Dollars
PAPER BASE STOCKS	.....	906,877	.....	8,149,576
Pulpwoods .....cords	4,304	26,288	12,104	66,458
Wood pulp:				
Sulphite wood pulp.....tons	14,808	769,679	124,348	6,815,640
Soda wood pulp.....tons	25	1,390	1,196	69,228
Other wood pulp.....tons	405	18,100	2,073	120,691
Rags and other paper stock..lbs.	8,745,950	91,420	107,527,402	1,077,559

Finch, Pruyn & Co. Get-Together

[FROM OUR REGULAR CORRESPONDENT]

GLENS FALLS, N. Y., March 9, 1936—The seventh annual banquet and get-together meetings of employees of Finch, Pruyn & Co., was held here last week, at which addresses were given by Matthew J. Burns, president of the International Brotherhood of Papermakers, Byron J. Lapham, vice-president of the company, and others. More than 200 men attended the event. Mr. Burns warned the workers against their right to organize in a way that will react against them and said that the public will not tolerate unions organized for the purpose of destroying industry. He also called attention to the failure of the government to protect the paper industry against foreign competition, saying it was inconsistent on the part of the government to expect us to maintain salaries and at the same time not give us any protection. He also referred to competition, declaring that he had often marveled at the ability of the local company to keep going in the face of that competition. He also discussed the policy of the Hearst publications in buying newsprint abroad, saying he had already taken the matter up with that organization.

Samuel Pruyn, sales manager, stated that barring accidents to equipment the mills of the company will operate 144 hours a week for the entire year. The company is now employing 260 men and the plant is operating six days weekly on day and night schedules. It is claimed by officials that production is greater than ever before and that a good year ahead is the prospect. In his remarks Mr. Pruyn noted that the mill's record of no lost time accidents was now 242 days.

Arthur Huggins, secretary of the International Brotherhood of Papermakers, paid tribute to officials when he said the president, Maurice Hoopes, had proven he could put cooperation into practice in the mill without having to talk about it. Several years before the NRA came into being Mr. Hoopes suggested shorter hours for workers in order that more men could obtain work and this policy was continued under NRA, he said.

New England TAPPI To Hear Williamson

The New England Section of the Technical Association of the Pulp and Paper Industry will meet at the Nonotuck Hotel, Holyoke, Mass., on Friday evening, March 20, at 6:30 P.M.

The speaker will be Harry Williamson of the Robert Gair Company, New York, N. Y., who will talk on "Stock Preparation."

Packaging Show a Success

The Sixth Packaging Conference and Exposition of the American Management Association was held at the Hotel Pennsylvania, New York, N. Y., on March 3 to 6, 1936, and was attended by nearly ten thousand individuals.

A feature of the meeting was the large exposition which featured all kinds of containers. Among the paper companies that had booths were the American Coating Mills, Container Corporation of America, Robert Gair Company, Hinde and Dauch Paper Company, Kalamazoo Vegetable Parchment Company, Lowe Paper Company, Rhinelander Paper Company and the Riegel Paper Corporation.

Papers Presented

Among the papers presented were the following:

Standards for Protective Materials, by C. A. Southwick, General Foods Corporation.

Packaging Fallacies or Fetishes, by William Guyer, Seagrams—Distillers Corporation.

Packaging as it Relates to Merchandising and Advertising, by C. L. Eddy, E. R. Squibb & Sons.

Packages and Production Machinery, by George R. Webber, Standard Brands, Inc.

The Purchasing Agent Selects Shipping Containers, by S. T. Edgerton, U. S. Rubber Products, Inc.

Transportation Problems in Connection with the Handling of Containers, by G. M. Dallas, Railway Express Agency, Inc.

The Value of the Compression Test in Determining the Strength of Boxes, by J. D. Malcolmson, Robert Gair Company, Inc.

Mr. Malcolmson said in part: "Recent improvements in the compression resistance of corrugated boxes has had some interesting echoes in laboratory practice. For one thing, it has forced the venerable drum tester into the background. We used to feel that tumbling a box to destruction in the drum was the last word in testing. We now realize that the same contents in a burlap bag would far exceed any box if measured by its resistance to this method. Today all shippers realize that the outside of a fibreboard container may look entirely undamaged, whereas the contents may be in a sad state from outside compressive forces which have left no mark on the elastic outer case. And the sad part is that you don't collect any claims on concealed damage which you don't find until long after you have signed the freight receipt.

"The compression test, when applied with a correct knowledge of total pressure, maximum deflection, and known moisture content (or relative humidity), therefore, gives a much more intelligent value of a case whose primary function is to protect the contents. The result is that a great many laboratories are now equipped with such apparatus. Many are home made, or built to order, but, more and more, these are becoming standardized. Thus, the Tinius Olsen Company, of Philadelphia, one of the best known makers of all sorts of testing equipment, has developed a special compression tester for corrugated and solid fibre boxes, which is the standard today. This machine is equipped with an autographic device which leaves a permanent record of the simultaneous pressure and deflection at any given moment.

"Research with these instruments is doing much to teach both box makers and shippers just what it takes to guard against the hazards of transportation with a minimum of extravagance. Eventually, we hope to approach that ideal of efficiency and economy known as the 'perfect container'—one that will deliver its contents to destination in perfect condition and then fall apart all over."

A. T. Nesbitt Heads Cincinnati Cordage Co.

A. T. Nesbitt has been elected president of the Cincinnati Cordage and Paper Company, Cincinnati and Dayton, after serving as vice-president for a number of years. He joined the company as a salesman soon after its founding in 1892 and traveled for the firm for a number of years.

At the time of the Dayton flood in 1913 he organized the Dayton branch of the company, which occupies commodious quarters on East Third street, and has since been in charge of this business. He was chosen vice-president of the parent company in 1902.

Don Nesbitt, his son, who is a salesman for the firm, has

A. T. NESBITT

been elected on the Directorate, which also includes Llewellyn Evans, E. W. Church, R. Gale Evans and E. F. Evans, all of Cincinnati.

Mr. Nesbitt will continue to reside in Dayton for the present, at least. The principal house of the company is located in Cincinnati.

Government Paper Bids and Awards

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., March 11, 1936—The R. P. Andrews Paper Company has been awarded the contract for furnishing the Government Printing Office with 45,760 pounds of 50 per cent rag cream white laid paper at 12.78 cents per pound.

Barton, Duer & Koch Paper Company will furnish 34,825 pounds of coated book paper at 6.35 cents per pound and the R. P. Andrews Paper Company will also furnish 55,575 pounds of offset book paper at 5.72 cents per pound. Bids for all of these items were received on February 26.

The Printing Office has received the following bids for 5,000 sheets of Whiting's woven linen azure note paper; R. P. Andrews Paper Company, at $25.70 per M sheets; Whitaker Paper Company, $9.30; Mathers-Lamm Paper Company, $24.30.

Waldo L. LaCross Goes To Chicago

[FROM OUR REGULAR CORRESPONDENT]

HOLYOKE, Mass., March 10, 1936—Waldo L. LaCrosse of this city, salesman for the American Writing Paper Company, Inc., has been appointed to the Chicago office and district, taking the place of the late Albert Forsythe.

Indianapolis Demand Expands

INDIANAPOLIS, Ind., March 2, 1936—With somewhat warmer weather, the paper trade in this territory shows some definite signs of improving. For a time during January and February the outlook was not so good. Temperatures were down below zero most of the time, which freezes out business in this section of the country. Volume of bag and wrapping paper sales dropped drastically. Buyers declared there was little demand due to the fact that a small volume of retail business was being done. Other lines also were affected adversely.

During the last week the situation has changed materially. All lines of paper appear to be in better demand than they were. Perhaps one of the busiest industries in the state right now is the container industry. One of the largest plants in the state here is working virtually night and day and while other perhaps are not working in so great a volume, their business has picked up and production has been increased. The period of short inventories has just passed for another year. In this state taxes are based on inventories as of March 1 and with this date over both jobbers and manufacturers of containers, boxes and other materials can begin to build up their warehouse stocks. From the manner in which production is being boosted, it appears this is the course that is being taken.

In virtually all paper lines, prices are being firmly held. The fine paper business is somewhat better fixed than it was at the turn of the year. Volume has increased slightly and jobbers report that credit conditions are materially improved. The number of orders that are going out on a cash on delivery basis is smaller than it was this time last year and more who have credit are discounting their bills. There remains some catalogue work to be done yet, but most of this business has been finished.

Paper stock men here say there is some mill demand, but nothing like what there should be. Inquiries are being received, however, and business is in prospect. Most of the demand is for better grades of paper and rags.

Albert H. Hooker Dead

NIAGARA FALLS, N. Y., March 9, 1936.—Albert Huntington Hooker, a leading electrochemist, died of pneumonia this morning at the age of 70 at his home in Lewiston. He had been in poor health for some time.

He was born in Rochester. His grandfather, Horace Hooker, settled in Western New York in 1815, the family being descended from the Rev. Thomas Hooker, founder of Hartford, Conn.

Mr. Hooker studied chemistry at the University of Rochester, which awarded him the honorary degree of Master of Science in 1920. Later he studied at the Massachusetts Institute of Technology.

Since 1888 he had been engaged in industrial chemistry and had been an executive of the Hooker Electro-Chemical Company for more than thirty years. He was one of five brothers connected with the Hooker corporation.

As an internationally recognized authority on electrolytic alkali and chlorine products, he contributed technical articles to various journals on chemistry. Recently he completed a special development of caustic soda for use in the rayon industry.

Mr. Hooker's widow, the former Ambolena Jones of Chicago; three daughters, Mrs. Richard Cary of New York, Mrs. Bjarne Klaussen of Lewiston and Mrs. Blanche Blanchard of Bronxville; two sons, Albert Huntington Hooker Jr. and Roger Wolcott Hooker; four brothers, Elon, Willard, Harry and Paul Hooker, and two sisters, Miss Margaret Hooker and Mrs. E. Maurice Trimble, survive.

A New Stickle Steam System for Reducing Production Costs

The Stickle Steam Specialties Company, of Indianapolis, Ind., has just issued Bulletin No. 60 which describes the new Stickle Steam System for paper manufacturing. While the term new is employed, it is stated that the system is absolutely new only in the sense that it now represents a *complete* system. Some of its elements have been used several years and are in operation on hundreds of paper machines where they have demonstrated their efficiency and value.

Specifically, the complete Stickle Steam System for paper manufacturing is said to offer:

1. A lowering of fuel costs by ten to fifteen per cent, combined with an equal or greater increase in boiler capacity.

2. An increased capacity for driers of from twenty to thirty per cent.

3. An improved control that amounts not only to positive regulation of quality, but practically to positive determination of quality.

4. A gratifying improvement in general production efficiency indicated in smoothness of operation.

5. A substantial saving due to lower upkeep and longer life of equipment.

The *complete* Stickle Steam System is said to be so positive that the actual savings it will afford and the actual increase in production and efficiency it will effect can be predetermined for any proposed installation upon a basis of present operating conditions.

Bulletin No. 60, which comprises twenty pages of text matter, containing many interesting graphs, describes the *complete* Stickle Steam System in detail, and may be had free on request.

Increased Activity In Swedish Newsprint

WASHINGTON, D. C., March 11, 1936—Production and exports of newsprint from Sweden during the past year registered appreciable increases over 1934, a report to the Commerce Department from its Stockholm office shows.

According to statistics issued by the Swedish Paper Mills Association, the output of its member plants in 1935 totaled 267,556 metric tons, compared with 247,133 tons in 1934.

Statistics from the same source covering exports show that aggregate shipments abroad in 1935 amounted to 208,688 metric tons compared with 188,152 tons in 1934. Exports to the United States, the outstanding foreign outlet for this item, amounted to 87,447 tons in 1935 compared with 63,595 tons in 1934. Consignments to Argentina totaled 32,864 metric tons in 1935 against 24,532 tons in the preceding year. The United Kingdom and France ranked third and fourth, respectively, as destinations for Swedish newsprint exports in 1935, the report shows.

Total production capacity of Swedish newsprint mills in 1935 was 350,500 metric tons, according to the trade association figures.

Stream Pollution Hearing Postponed

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., March 11, 1936—The hearing which was to have been held on the stream pollution bill before a subcommittee of the Senate Committee on Interstate Commerce on March 16, has been postponed until March 23. It is expected that the paper industry will be heard in opposition to the bill at that time.

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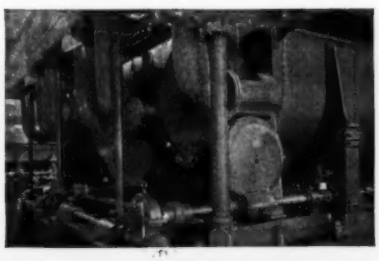
BIRD  SCREENS

YOU CAN MAKE MORE MONEY WITH NEW BIRD MACHINERY

CONSTRUCTION NEWS

A Summary of Vital Facts Regarding Construction, Finances and Operation of Paper Mills

Construction News

Port Angeles, Wash.—The Washington Pulp and Paper Corporation has approved plans for new addition to local mill, to be one story, designed for storage, distribution and other operating service. It is reported to cost about $30,000. General contract has been let to William Gorsegner, Port Angeles, and work will be placed under way at once. Company headquarters are at 343 Sansome street, San Francisco, Cal.

St. Louis, Mo.—The Cupples-Hesse Envelope Company, 4173 North Kingshighway, manufacturer of commercial envelopes and kindred paper products, has awarded general contract to the Gamble Construction Company, 620 Chestnut street, St. Louis, for proposed new addition to plant, previously referred to in these columns, and will proceed with superstructure at once. It will be two-story, 120 x 175 feet, adjoining present plant, and will be equipped for the manufacture of paper cups and allied specialties, a new line of output for company. Same contractor has also secured award for improvements and alterations in present plant. Entire project will cost over $85,000, with equipment. Plans were prepared under direction of the Austin Company, Arcade Building, St. Louis, architect and engineer.

Monroe, Mich.—Fire recently damaged a portion of mill of the River Raisin Paper Company, with nominal loss reported at about $10,000. Damage will be replaced at early date.

Brooklyn, N. Y.—The Brooklyn Standard Bag Corporation, recently organized with capital of 1000 shares of stock, no par value, to manufacture paper bags and containers, will take over and succeed to the Brooklyn Paper Bag Company, Inc., with local plant at foot of Van Dyke street.

Sebring, Ohio—The H. Bettis Company, Zanesville, Ohio, manufacturer of corrugated paper boxes and containers, has plans maturing for new branch plant at Sebring, where building on Twelfth street, formerly used for storage and distribution, will be remodeled and equipped for large capacity. It is proposed to have the plant ready for service late in the spring. It will cost close to $35,000, including equipment.

Ironwood, Mich.—The Marathon Paper Mills Company, Rothschild, Wis., is planning extensive operations at timber properties in the Ironwood district for pulpwood supply. It is proposed to cut about 25,000,000 feet of logs during the season, with mill and operations giving employment to about 475 men.

Valparaiso, Ind.—The Continental Diamond Fibre Company, Newark, Del., manufacturer of fiber products, has approved plans for new factory branch, storage and distributing plant at Valparaiso, to be one-story, 60 x 100 feet, estimated to cost close to $30,000, with equipment. General contract has been awarded to the Smith-Nuppan Company, Valparaiso, and work will be placed under way at once. L. L. Howard is local manager.

New York, N. Y.—The Tri-Boro Paper Company, Inc., 4185 Park avenue, Bronx, has arranged for increase in capital from $20,000 to $60,000 for general expansion in operations.

Buffalo, N. Y.—The duPont Cellophane Company, Inc., 350 Fifth avenue, New York, N. Y., manufacturer of transparent wrapping materials, is arranging for early resumption of operations at branch mill on River road, Buffalo, closed down for a number of months past. The unit is equipped with eight machines, and four of these will be placed in service, with large working force, totaling over 100 employes. It is expected that the other machines will be in production in the near future.

Albany, N. Y.—The Pak-Wik Corporation, recently organized with capital of $20,000, plans early operation of local plant for manufacture of collapsible paper boxes and containers. Incorporators of new company include Myron S. Strasser, 144 Dana avenue, and Eugene J. Nathan, 34 Glenwood street, both Albany.

Chillicothe, Ohio—The Chillicothe Paper Company, manufacturer of coated and other paper stocks, has awarded general contract to the Austin Company, Euclid avenue, Cleveland, Ohio, for three new additions to mill, recently referred to in these columns, and will proceed with superstructure at early date. The structures will be one-story, 80 x 100 feet, 61 x 108 feet, and 40 x 80 feet. The last noted will be used for office service, and space in present mill utilized for such purpose will be converted for manufacturing service. Entire project is reported to cost over $85,000, including equipment. Plans for the units were prepared by the Austin Company, noted.

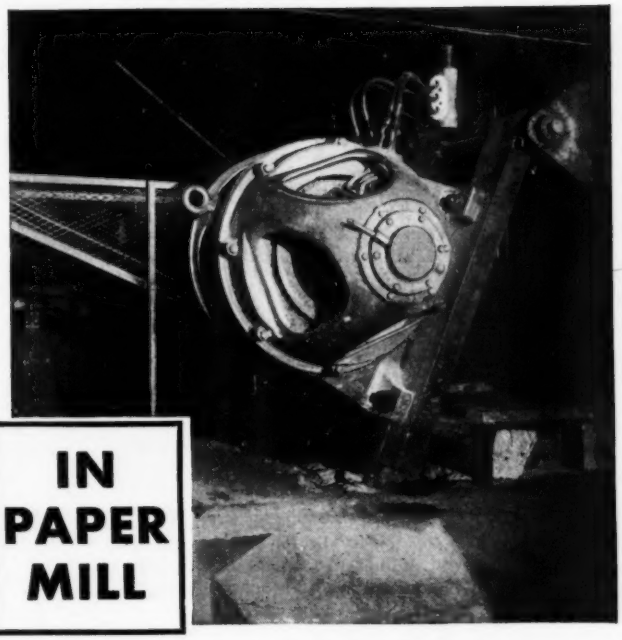
Mobile, Ala.—The Brown-Bridge Mills, Inc., Troy, Ohio, manufacturer of gummed paper tape, flat gummed papers for label production, and kindred paper stocks, has arranged for lease of building at the terminal of the Alabama, Tennessee & Northern Railroad Co., Telegraph road, Mobile, and will occupy for new factory branch, storage and distributing plant. Improvements will be made in structure and equipment installed at once. David Band and Eugene Bright will be in charge of operations at the new branch.

Asahi, Japan—Bemberg Rayon Company, Ltd., Asahi, has plans under way for construction of new local mill for manufacture of cellulose rayon products. It will consist of several large units, equipped for a capacity of about 10 tons per day. Plant is reported to cost over $1,000,000, with machinery.

New Companies

New York, N. Y.—The Keen Kovers, Ltd., has been incorporated with capital of 100 shares of stock, no par value, to manufacture and deal in paper boxes and con-

KABLE KORD OUTLASTS competitive belting 3 to 1



IN PAPER MILL

THE illustration shows a Gilmer Kable Kord belt doing a good job on a troublesome drive in one of the largest papermaking plants in the Fox River Valley.

Not only on this drive, but on another in the same plant, Kable Kord licked tough transmission problems. The latter is a drive from calender to dampeners, on which belt after belt was unable to stand up. Recently a Kable Kord was installed — 16′ 4″ long, 6″ wide, 3-ply, and joined with Crescent plates. It operates over a 6″ pulley on the calender and a 5″ pulley on the dampeners travelling at approximately 1200 feet per minute. Kable Kord outlasted the previous belt, a standard, high-grade competitive product, *three to one*. Thus, in paper mills as well as oil fields, textile mills and industrial plants, Gilmer Kable Kord proves its longer life and economy.

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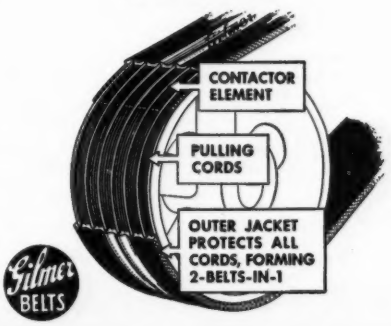

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SPECIALISTS IN QUALITY BELTS SINCE 1903

tainers of various kinds. The incorporators include N. J. Boots, 207 East Forty-third street, New York, and Charles A. Milton, 1352 street, Brooklyn, N. Y.

New York, N. Y.—The Greenger Corporation has been formed with capital of 100 shares of stock, no par value, to manufacture and deal in paper boxes and containers of different kinds. Ernst O. Troeger, 274 Madison avenue, New York, is one of the principal incorporators.

Boston, Mass.—The Novelty Paper Bag Company, 11 Albany street, has filed notice of organization, to manufacture and deal in paper bags and containers. Nathan S. Quint is one of heads of company.

Kalamazoo TAPPI Elects Officers

The monthly meeting of the Kalamazoo Valley Section of the Technical Association of the Pulp and Paper Industry was held March 5, at the Park American Hotel, Kalamazoo, Mich.

Merle R. Wilkins, Bryant Paper Company, was elected Chairman to succeed H. M. Annis, of Allied Paper Mills. Other officers elected were: W. F. Hathaway, Kalamazoo Vegetable Parchment Company, Vice-Chairman; W. J. White, Kalamazoo Vegetable Parchment Company, Secretary; and E. F. Whittington, Rex Paper Company, Treasurer.

The new Chairman, M. R. Wilkins, appointed the following committees: Program: W. F. Hathaway, Chairman, P. deGuehery, Michigan Paper Company, and M. F. Flotow, Watervliet Paper Company; Arrangements: J. E. Bauman, Kalamazoo Vegetable Parchment Company, Chairman, P. W. Bartholomew, Paper Makers Chemical Corporation, H. S. Farem, French Paper Company.

The speaker on the program was M. D. Bardeen, of the Lee Paper Company, who discussed "Beating and Beating Equipment." H. M. Annis, of the Allied Paper Mills, gave a report of the recent New York meeting and reviewed some of the papers presented at this meeting.

Those present were: Michigan Paper Company: A. E. Hays, D. L. Stocker, Paul deGuehery, R. L. Barton; Hawthorne Paper Co.: H. E. Stafford, C. C. Schneider; Kalamazoo Paper Co.: A. W. Macvie; Lee Paper Co.: A. Weinland, M. D. Bardeen; Paper Makers Chemical Corp.: F. K. Shankweiler, F. L. Chappel, Bud Mueller; Kalamazoo Vegetable Parchment Co.: F. D. Libby, H. Smith, W. Kottman, J. Bauman, W. F. Hathaway, R. B. Stewart, L. H. LaLiberte, A. Perlick, W. J. White; Rex Paper Co.: H. Nendorf, H. C. Bradford, E. F. Whittington; American Cyanamid and Chemical Corporation: W. S. Taylor, W. T. Snyder, V. E. Heinmuller; Bryant Paper Co.: C. A. White, R. A. Olson, A. Webb, A. B. Milham, J. L. Russell, M. R. Wilkens; Allied Paper Mills: H. M. Annis; University of Michigan: D. W. McCready; Sutherland Paper Co.: A. L. Sherwood; General Dyestuff Corp., Chicago: J. J. Nylund; Silvercote Process: W. S. Guyot, R. M. Ralston.

Stevens & Thompson Paper Co. Changes

The Stevens & Thompson Paper Company, 205 East 42nd street, New York, announces the addition to its sales staff of James G. Moran, who has had considerable experience in the paper business. Mr. Moran will cover the Virginia and North Carolina territory.

The company also announces that Frank I. Daniels, who has represented it for some time in the Metropolitan district, has been transferred to the central New York and Pennsylvania territory. Francis R. Nichol will represent Stevens & Thompson in the Metropolitan New York district.

ABITIBI CO. SALES INCREASE

(Continued from page 9)

Mr. Burke declared that it is labor's responsibility to co-operate with owners to protect workers, reduce the number of industrial accidents, keep production up to efficient standards in quality and quantity and to give the best possible service.

The Late Robert Gormully

Word has been received of the sudden passing at Clearwater, Florida, of Robert B. Gormully, a member of one of Ottawa's best-known families, and formerly a well-known official of the E. B. Eddy Company, Ltd. Deceased was born in Ottawa, the son of a prominent lawyer at the capital. He was widely known in paper circles.

Provinces Agree on Forest Policy

Ontario stands solidly with the Province of Quebec in all matters relating to the forestry industries, it was made clear this week by the Hon. Peter Heenan, Minister of Lands and Forests, when speaking to newspapermen following his conference with Premier Taschereau and the Quebec Minister of Lands and Forests. "The two provinces have so much in common in respect to the whole matter of forest products that it is considered advisable that we should get together and come to some understanding," said the Ontario Minister. After our conference today we have come to a complete understanding on the whole question, and we believe that a great deal of good will come out of the conference." Mr. Heenan said that under new policies his department put into effect some 15,000 extra men were at work last year in the forests, although the number employed this year so far was below that of last season.

Features of Waste Paper Meeting

Members of the waste paper industry will be interested to know that a paper prepared by Stuart B. Sutphin of Cincinnati, one of the most successful operators in the waste paper field, will be a feature of the program at the coming meeting of the Waste Paper Institute, which is to be held at the Hotel Astor, New York, on Tuesday, March 17, at 10 a. m.

Mr. Sutphin's paper, which is entitled "The Paper Stock Packing Industry," is a clear and well-thought out statement as to how a waste paper concern should properly function.

In addition to Mr. Sutphin's paper, there will also be a paper by the president of the Waste Paper Institute, David Charak, of St. Louis, on the subject "The Necessity For Supporting A Trade Association In The Waste Paper Industry."

Advance registration, both for attendance at the convention and at the annual banquet, indicates a record-breaking attendance at both.

The Story of Newsprint

R. S. Kellogg, secretary of the Newsprint Service Bureau, has been sending out reprints of a double-page spread, which appeared in the *Editor and Publisher* of February 29, 1936, under the title of "The Story of Newsprint Paper." This is the initial advertisement on behalf of the North American newsprint industry. There is to be a series of such advertisements throughout 1936, the purpose being to tell some of the basic facts about the newsprint industry in simple non-controversial fashion.

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Price, Per Copy, 10 Cents
United States, Per Annum, $4.00
Canada, $7.50; after Jan. 1, 1936, $6.00. Foreign Countries in Postal Union, $6.00
Member Audit Bureau of Circulations
Vol. CII New York, March 12, 1936 No. 11

FUTURE MEETINGS

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, Summer International Meeting in Canada, August 3 to 7, Montreal, Quebec, The Saguenay. Details may be obtained from the secretary, R. G. Macdonald, 122 East 42nd street, New York.

NEW ENGLAND SECTION, Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Nonotuck Hotel, Holyoke, Mass.

DELAWARE VALLEY SECTION, Technical Association of the Pulp and Paper Industry—fourth Friday of each month at the Engineers Club, Philadelphia, Pa.

LAKE STATES SECTION, Technical Association of the Pulp and Paper Industry—second Tuesday of each month at the Conway Hotel, Appleton, Wis.

KALAMAZOO VALLEY SECTION, Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park-American Hotel, Kalamazoo, Mich.

AMERICAN PULP AND PAPER MILL SUPERINTENDENTS' ASSOCIATION, Annual convention, Grand Rapids, Mich., June 24-26, 1936.

PAPER INDUSTRY CONTINUES TO REFLECT IMPROVED TREND

Based upon conditions indicated for the first half of 1936, output of the paper industry should exceed that for the initial six months last year, while prices, in practically all instances, should stabilize around current levels. This conclusion is reached by the Standard Statistics Company, well known business analyists, after a careful survey of the industry, which has just been completed.

Continuing the same rate of gain displayed earlier in the year, the survey says that production on all primary grades of paper, including newsprint and paper boards, for the twelve months ended December, 1935, was approximately 15.6 per cent ahead of that for the similar period of 1934. That general stability of prices was maintained throughout the period is indicated by the almost equal per cent gain in total value of shipments.

Production in the closing months of the year, moreover, showed strong resistance to usual seasonal influences, and operations were maintained at better than average levels. This was particularly true in the paper board division, which sustained operations at a proportionately good rate through the normally dull months of November and December. For the full year, the industry as a whole operated at about 71.2 per cent of capacity.

The improved trend has continued thus far in the current year, January operations having been at 76.2 per cent of capacity, as against 65.8 per cent for January, 1935.

The exceptionally high level of activity maintained by the paper board industry in the closing months of the year is shown by the fact that output for October and November, 1935, was at 79.5 per cent and 73.6 per cent of capacity, as against 63.9 per cent and 57.8 per cent of capacity, respectively, for the similar months of 1934. While operations for December dropped to 60.9 per cent, this figure compares with 54 per cent for December, 1934, and with 47.1 per cent for the final month of 1933. Accordingly, output for this division was approximately 16 per cent above that for 1934.

Prices of paper board throughout 1935 showed a tendency to decline, although firming toward the close of the year. Prices will remain stable or possibly advance slightly during the next few months, snowstorms and cold weather having delayed collections of waste paper, with the result that this necessary raw material has advanced in price from 20 per cent to 25 per cent. Demand for paper board will probably be active during the next several months, and on the basis of present indications, it is estimated that earnings of paper board manufacturers for the current six months will generally approximate those for the first half of 1935.

Detailed statistics on the production and consumption of kraft paper as such are not available, but with consumption of various types of paper, such as kraft wrapping paper, paper bags, etc., and the production of sulphate pulp showing considerable gains, materially improved conditions for kraft paper producers was indicated for the second half of 1935. Uncertainties concerning the fate of the NRA and the possible effects on the paper industry led to some price irregularity in the preceding six months, with the result that earnings of kraft producers as a whole probably showed some moderate reduction for 1935. However, with indications pointing to firm prices and excellent demand, earnings of kraft manufacturers for the first half of 1936 should substantially exceed those for the similar period of 1935.

Production of printing papers gained about 15.6 per cent in 1935, as compared with 1934. This rise was about equal to that for the industry as a whole. Magazine advertising expenditures—the chief determinant of printing paper activity—gained only about 4 per cent in 1935. Prices in this division remain relatively steady, so that producers will be dependent upon increased magazine advertising and circulation for further betterment in 1936 earnings, a condition which appears probable in view of the outlook for increased advertising expenditures during the current year.

Writing paper production rose 20.5 per cent during 1935, with prices generally maintained at stable levels. This condition permitted an appreciable improvement in earnings of manufacturers. With increased public purchasing power indicated for 1936, profits of the better situated organizations in this branch should expand further

Production of newsprint by United States and Canadian mills for 1935 totaled 3,665,681 tons, a gain of 3 per cent over 1934. Canadian mills accounted for about 75 per cent of the total, establishing an all-time peak. On the basis of present indications, Canadian production for 1936 will reach another new high, while the United States will do well to equal 1935 output. An indication of the possible trend is afforded by January production figures, which show a gain of about 12.8 per cent over last year for Canada and a decline of slightly over 1 per cent for the United States.

The price of newsprint has been established at $41 for 1936, a rise of $1 a ton. The increase is unlikely to improve profit margins, however, for costs are also higher. Accordingly, there is little possibility of more than a nominal gain in earning for newsprint companies until 1937, when a further price rise is expected.

TAPPI Receives R. M. Snell Library

Through the thoughtfulness of Mrs. Ralph M. Snell, the extremely interesting and useful collection of books of Mr. Snell have been presented to the Technical Association of the Pulp and Paper Industry.

Mr. Snell was the Chairman of the TAPPI History and Biography Committee and had interested the industry for several years prior to his death with his fascinating articles that delved into the beginnings of paper companies, particularly in the United States. It had been his intention to retire from active business and devote all of his time to the compiling of items of historical and biographical interest.

It is the intention of the association to suitably house the collection as a memorial to Mr. Snell and to continue to enlarge the collection with new books and original documents of a historical nature. Everyone engaged in the pulp and paper and related industries are urged to cooperate with TAPPI and either donate or loan to it any book or document of a historical nature relating to the history of individual companies. The History and Biography Committee will be grateful to any individual who has been connected with the industry for twenty-five or more years to write about themselves and their associates in the industry during that period. Biographical notes concerning the origin of paper companies, paper machinery builders, etc., and in particular comments on pioneers in the industry who are no longer alive are wanted. Individuals who have been associated with such pioneers should utilize this opportunity to record their experiences and knowledge concerning them. All items of this kind should be sent to the Technical Association of the Pulp and Paper Industry, 122 East 42nd street, New York, N. Y.

To Manage Sacramento Division

The appointment of John H. Leatherman, Seattle business and advertising executive, as general manager of the Blake, Moffitt & Towne Paper Company in charge of the Sacramento, Cal., division, and that of James C. Whitelaw as general manager of the Seattle division, has been announced by O. W. Mielke, general manager of the company.

For the past fifteen years, Mr. Leatherman has been associated with the Seattle branch of the company, and has been in charge of the printing paper department since 1930. For six years previous, he represented the company in Bellingham.

Plans for Waste Dealers Meeting

The following is the program for the Twenty-third Annual Convention of the National Association of Waste Material Dealers to be held at the Hotel Astor, March 16 to 18, inclusive.

MONDAY, MARCH 16

9:00 A.M. to 5:00 P.M.—Registration.
12:00 o'clock noon—Luncheon Meeting Executive Committees of Affiliated Associations.
2:00 P.M.—Waste Material Forum.
7:00 P.M.—Meeting Board of Directors.

TUESDAY, MARCH 17

9:00 A.M. to 5:00 P.M.—Registration.
10:00 A.M.—Meeting Waste Paper Institute.
12:00 o'clock noon to 2:00 P.M.—N.A.W.M.D. Luncheon Club (Open House– All Delegates Invited).
2:00 P.M.—Annual Meeting Secondary Metal Institute.
2:00 P.M.—Meeting Scrap Rubber Institute.

WEDNESDAY, MARCH 18

9:00 A.M. to 2:00 P.M.—Registration.
10:00 A.M.—Conference Meeting Associated Rag Industries and Writing Paper Manufacturers Association.
1:00 P.M.—Members' Luncheon (All Delegates Invited).
2:00 P.M.—Annual Meeting National Association of Waste Material Dealers, Inc.
3:30 P.M.—Annual Meeting Board of Directors.
7:00 P.M.—Twenty-third Annual Banquet (Grand Ballroom).

Some Convention Papers To Be Presented

"Can a Trade Association Be Expected to Solve Problems or Change Conditions Which Are Economic In Origin?"—By E. B. Friedlander.

"The Broker's Place in the Waste Material Trade."—By Carlton B. Overton.

"How Waste Material Dealers Might Strengthen Their Buying Connections with Industrial Concerns."—By R. W. Phillips.

"The Importance of Proper Grading."—By Louis Lippa.

"The Necessity for Supporting a Trade Association in the Waste Paper Industry."—By David Charak.

"The Paper Stock Packing Industry."—By Stuart B. Sutphine.

"The Growing Importance of Non-Ferrous Scrap Metal."—By Elmer W. Pehrson of U. S. Bureau of Mines.

"Cellulose Acetate In Cotton Cuttings."—By E. O. Reed of Crane & Co.

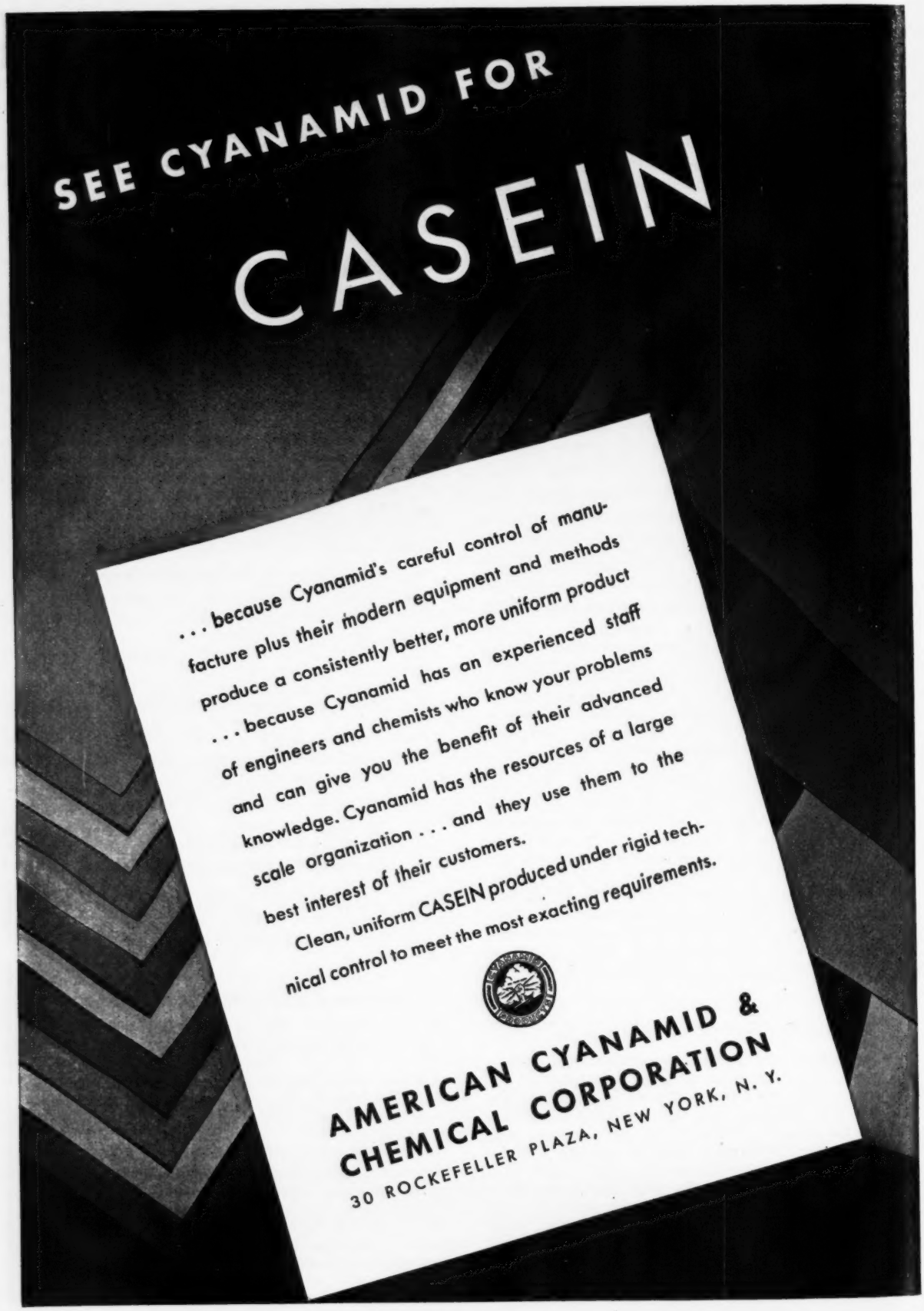
Other papers will be presented by Egmont Frankel, Joseph Schapiro, I. A. Barnett, M. C. Dobrow, Treasurer, Writing Paper Manufacturers Association and Chas. P. Hull.

Standard Paper Mfg. Co. Changes

James F. Ryland, vice-president and general manager of the Standard Paper Manufacturing Company, Richmond, Va., announces that effective January 1, 1936, G. A. Carlton was made sales manager of the company, located at Richmond, Va., and James W. Knox was made Western sales representative located in the Conway Building, Chicago.

Effective March 1, 1936, Harry Deffew was made superintendent, succeeding Carl Magnus who has accepted a similar position with the Waterfalls Paper Company, Mechanic Falls, Me.

The Standard Paper Manufacturing Company reports volume of business considerably improved in 1936, but prices generally unsatisfactory.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Section of the
Technical Association of the Pulp and Paper Industry
Edited by Ronald G. Macdonald, Secretary

A Study of the Relation Between the Chemical and Physical Characteristics of Representative Types of Pulp*

Geo. H. McGregor[1]

Abstract

A comprehensive study has been made on the relationship between pertinent chemical constants and significant physical properties of representative paper making pulps. Three standard type pulps such as blue denim, rag, Alpha, and Mitscherlich pulps were degraded to definite degrees of cuprammonium viscosity by means of the three degrading influences to which paper pulps are usually subjected in their process of preparation such as acids, bleach, and heat. The pulps were degraded under definite conditions of time, temperature, and concentration to viscosities representing two-thirds, one-half and one-third the original value. Physical and chemical properties of the pulps were then determined by standard methods. The relationship noted throughout the experimental part of this paper point to the fact, that: 1. Degradation of pulps can be followed by the cuprammonium test. 2. There appears to be a definite relation between viscosity and fold quality of various types of pulps. 3. Relation between physical and chemical properties of pulps and degrading influences is specific in nature. 4. It would appear that acid causes least degradation of cellulose, bleach next, and heat the greatest change in given qualities.

A comprehensive survey of the literature of the subject is offered along with a detailed discussion of latest concepts of cellulose structure.

Considerable has been written on phases of that exceedingly pertinent subject, notably the relationship between the chemical and physical characteristics of various types of pulp. The influence of various reagents or conditions of treatment has been extensively studied in their relationship to the resulting properties of the ultimate product.

Of fundamental concern to the pulp and paper manufacturer is the preparation of three major representative pulps, rag half-stuff, purified wood pulp or Alpha pulp, and regular bleached sulphite pulp. In the normal preparation of each type the fundamental basic substituent, cellulose, is subjected to more or less drastic conditions which tend to alter, in one respect or another, the chemical stability of the unit resulting in an ultimate product inferior in varying degrees to that which might be characterized by pure cellulose.

In the field of rag half-stock preparation and fine rag paper the cellulosic material is usually subjected to an alkaline digestion at about 40 pounds pressure in order to remove fats, waxes, resins, and other contaminating extraneous materials. Subsequently, the somewhat purified cellulosic material is subjected to a bleaching action by means of calcium hypochlorite bleach, usually at a low concentration of bleach liquor, in order to provide a material as white and bright as is commercially feasible. Other oxidizing agents are occasionally utilized in the numerous methods of purification of the half-stock. Many mills use sulphuric acid to brighten the product at the end of the bleaching operation.

In the normal sizing of various papers a pH on the acid side is usually maintained. Such an acidic condition must ultimately exert its influence on the fiber.

Cellulose is likewise subjected to heat during the digestion; in some instances to a slight steaming preparatory to the bleaching operation, and during the passage of the paper or pulp web over the hot cylindrical drier section of the paper or pulp machine.

In the manufacture of purified wood pulp, the fibers are usually subjected to very drastic treatment, involving the use of high temperature and pressure digestion, strong sulphite acid treatment, purification by means of chlorine and calcium hypochlorite, usually low pressure alkaline digestion, and finally direct heat in the drying process. The original material is thus modified so that certain of the less stable components are removed and the chemical constants indicate a purer product. At the same time, the physical properties of this product differ in a marked degree from that of regular bleached pulp.

Cellulose in the form of sulphite pulp, likewise undergoes extreme conditions of degradation including high temperature digestion, fairly concentrated sulphite cook-

* Presented at the fall meeting of the Pacific Section of the Technical Association of the Pulp and Paper Industry, New Washington Hotel, Seattle, Wash., Oct. 25-26, 1935.

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ing acid, purification by bleaching, and heat treatment in drying.

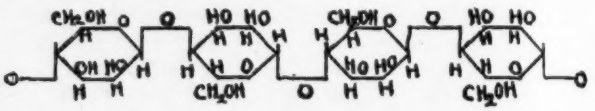
Thus, in the usual preparation of these three representative cellulose products used in the manufacture of paper, the cellulose chains and the fiber structures undergo a series of treatments or operations so that one marvels at the high degree of purity of the resultant product. It is hardly conceivable that such action would not in some manner or other affect not only the chemical characteristics, but also the physical properties of the fiber. Whether such physical changes may be followed universally by some one chemical characteristic has never been demonstrated, but has been rather widely assumed in the widespread use of chemical tests for following pulp characteristics.

A survey of present-day concepts of the fundamental structure of the cellulose unit and the possible avenues of attack by various degrading agencies on this unit might assist in formulating a picture of the probable behavior of cellulose and the fiber to the various conditions under which it is subjected.

As a chemical unit, cellulose is classified as a complex polysaccharide possessing the general formula $(C_6H_{10}O_5)_n$. This chemical material is found in a regular structural arrangement in the fiber, either of cotton, wood, linen, etc. The fiber is recognized as an organized assembly of related units. A rather clear cut picture has been formulated by Ludtke *(1)* and summarized by Weil *(2)* as follows: The central canal of the fiber is commonly called the lumen, this unit being surrounded by the tertiary lammella, a skin substance of furfuroidal character. The secondary lammella composed of cellulose units are arranged in layers over the lumen and are divided by concentric rings of skin substance. These secondary layers seem to be separated longitudinally by the skin into strips which are wound spirally around the axis of the fiber. The inner layer strip, that is the one nearest the lumen, is nearly parallel to the axis of the fiber and, as the strips extend outward, they assume a smaller pitch until on the outer layer they are assumed to be wound directly around the circumference of the fiber. In this manner the inner layers contribute strength in the long direction, and the outer layers impart stability to the entire fiber. The individual strips are presumed to be made up of fibrils whose morphology is somewhat questionable. In addition, the fibrils are separated transversely by fine skin-like substance, also probably of furfuroidal character, into smaller fusiform bodies *(3)*. These small units are presumably the smallest building elements of the fiber surrounded by the skin-like covering. The chief chemical component of the fibrils is cellulose; the skin-like substance on the other hand is probably furfuroidal in character. The entire unit is encased in the outer or primary lammella, of skin-substance intimately associated with the transversely wound outer fibrils of cellulose.

The fusiform bodies, or crystallites are made up of long chain molecules of cellulose of molecular weight approaching 400,000. These chains are associated in parallel arrangement, spaced regularly so as to form the cellulose crystal cell. The unit cell of the crystal is assumed to be composed of four glucose units, the size of the crystal being of the order of ten Angstrom units by eight Angstrom units by eight Angstrom units.

Numerous investigators have studied the structure of the fundamental unit or micelle. Meyer and Mark *(4)* in their extensive X-Ray researches consider the fundamental unit of structure of cellulose to be the micelle, in which a great many large molecules are maintained in ordered arrangement by the secondary valences of their hydroxyl groups. Lewis *(5)* offers a concise yet complete review of the subject of the structure of cellulose, especially the detailed works of Staudinger and Schweitzer *(6)* on high polmeric compounds with especial reference to the size of the cellulose molecule; Carothers' *(7)* detailed work on polymerization, and the molecular weight of cellulose and Katz' *(8)* work on researches relating to X-Ray spectroscopic investigations concerning the character of the swelling of substances which give a fibrous diagram. In this review he states that "cellulose may be considered as consisting of long polymeric chains of amylene oxide anhydro-glucose rings, the structural units of which are held together by means of acetal linkages between the No. 1 carbon of the ring and the No. 4 carbon of the next ring. The second ether bridge of the acetal linkages being possibly of the ring closure and possibly of the beta-glucoside type, and further indicates the following structural formula for the cellulose chain:



"The old picture of a molecule as an entity of unchanging weight and size does not hold with polymers like cellulose. Molecular sizes are average. Long and short chains are mixed and any possible molecular weight values would represent only an average figure of all the chains present. With the picture for cellulose structure we can classify reactions according to those affecting primary valence linkages on the one hand and secondary valence linkages on the other. In certain cellulose reactions both types of change occur. Under certain conditions the secondary valences are first attacked, resulting in physical depolymerization, followed by reactions involving the primary valences. As a rule the intermicellar reactions are the first to take place, resulting merely in a decrease in micelle size. Subsequently, occur chemical reactions that alter the units. Acetal linkages joining anhydroglucose units are hydrolyzed, the length of the chain is altered."

In the normal preparation of rag, Alpha, and sulphite pulps a certain degree of degradation is almost certain to occur. Early stages of degradation, therefore, probably cause micellar splitting, followed by chemical depolymerization.

In the cellulose chain molecule as usually listed, the following main structural feature are evident:

1. Primary alcohol groups
2. Secondary alcohol groups
3. C-H. linkages
4. Acetal formation
5. Hemi-acetal formation
6. Amylene oxide ring structure

Cotton cellulose of the structure $(C_6H_{10}O_5)_n$ contains three alcoholic hydroxyl groups for each six carbon atoms as is shown by the formation of its trimethyl and triacetate derivatives. Complete hydrolysis results in the formation of glucose. Acetolysis yields cellobiose octa-acetate and glucose penta-acetate. Methylation and hydrolysis result in the formation of the definite compound 2, 3, 6, trimethyl glucose.

The alcoholic nature of the cellulose micelle can readily be attested by the following reactions common to the aliphatic alcohols, alcoholate formation, ester formation, ether formation, and oxidation with consequent formation of aldehyde and acid.

Cellulose reacts with N_aOH in the ratio of one N_aOH to $C_6H_{10}O_5$ groups. Cellulose ester formation takes place by the action of nitric acid on cellulose with the predominant formation of the trinitrate. Cellulose also forms esters with sulphuric acid. The composition of the ester is dependent on the concentration and time of contact and

on the temperature of the acid. The formation of the acetate has already been mentioned.

Cellulose ethers may be formed by the same methods that are used for aliphatic alcohols; namely: (1) through action of alkyl halides upon alcoholates and (2) by the action of esters upon alcohols, dimethyl sulphate being used.

In the normal reactions involving cellulose and acid or alkalies or heat there is undoubtedly a certain amount of degradation of the cellulose with consequent depolymerization, aldehyde, and acid formation. Oxidation usually results in the formation of simpler products of an aldehyde nature as evidenced by increased reducing properties and some acidic formation. The action of acids results in the formation of the so-called intermediate products hydrocellulose, and finally glucose. In either case it is nearly impossible to obtain uniform intermediate products, the hydrolysis failing to stop at any one point or at the formation of any one group of compounds.

The carbon hydrogen linkage under rather drastic circumstances may split with the formation of smaller sugar units. The acetal structure of the molecule may be easily hydrolyzed and the hemiacetal structure more so. The amylene oxide structure may be altered to form sugar units of less complexity.

Thus, the degrading influences of heat, acid, and bleach find an active point of contact with the cellulose micelle.

This research embodies an attempt to follow the effect of the above mentioned degrading influences under given conditions on the physical and chemical properties of the cellulosic materials represented by a high grade rag halfstuff, a commercial Alpha pulp, and a regular bleached Mitscherlich sulphite pulp.

Historical Survey

The subject of degradation of cellulose by chemical means, resulting in the alteration of chemical constants, has been quite extensively studied. Among the latest contributions to this field of research is that of Lewis *(9)*. In this he describes the changes in chemical constants and the effect of degrading influences on the chemical properties of No. 1 muslin, blue-overalls, thirds and blues, Alpha, and super Alpha as the result of degradation by heat with air, oxygen, and nitrogen, as well as sulphuric acid at concentrations of 1, 10, and 15 per cent, light with the carbon-arc fadeometer and Cooper Hewitt quartz mercury vapor lamp, and alkaline solutions. The various chemical constants followed included the cuprammonium viscosity, alpha cellulose; the products of degradation, carbon dioxide and the volatile alphatic acids such as formic and acetic. The results of this paper may be summarized by stating that the higher the chemical purity of the material in terms of alpha cellulose, viscosity, and copper number, the longer will such stocks resist degradation. The highest chemical purity of all the stocks investigated was possessed by the No. 1 muslin rag stock. The only difference in rates of degradation was noted in the effect of the light of the carbon arc fadeometer; here the viscosity drops in the case of highly purified wood pulps occurred at a faster rate than did the drop with the rag stocks.

In a later paper by Lewis *(10)* he describes the degrading action of calcium hypochlorite solutions on bleached rag half-stocks bleached, highly purified sulphite pulp, regular bleached sulphite pulp, using bleach solutions at a concentration of 5 and 10 grams of available chlorine per liter. The degradation was followed at 25, 37.5, and 50 deg. C., using as a measure of degradation decreases in cuprammonium viscosity and alpha-cellulose, and increases in beta- and gamma-cellulose and copper number. The general results indicate that at 25 deg. C., the stocks change only slightly from a chemical standpoint, although the colloidal structure is rapidly altered, at 50 deg. C. the colloidal degradation proceeds rapidly, followed by a marked change in the chemical structure of the pulp; while the alpha cellulose disappears to a considerable extent, being converted into beta-cellulose, only a relatively slight change in the gamma-cellulose is noted.

An additional difference between the Alpha and rag stocks is indicated by the fact that the copper number of the purified wood pulp shows a more rapid increase as the result of oxidation than to the rag stocks. Likewise, the wood pulps go into solution at a somewhat more rapid rate as a result of oxidation at 50 degrees than do the rag stocks.

Various aspects of the relationship between the chemical constants of pulps and their physical characteristics have been studied. Bialkowsky *(11)* following the change in cuprammonium viscosity of cotton cellulose in the bleaching of rag stocks, shows that while the viscosity falls, due to the bleaching operation, the folding endurance of hand sheets made from the stock falls likewise and in the same relative order. Clibbens and Geake *(12)* of the British Textile Institute state that the measurement of the rate of flow of a solution of cotton in cuprammonium offers the most generally useful method for detecting loss of strength caused by chemical attack of cellulose in the bleaching and finishing of cotton textiles. Clibbens and Ridge *(13)* have also shown that the viscosity of cotton in cuprammonium decreases uniformly with decrease in tensile strength when the cotton is subjected to various forms of chemical attack such as alkaline and neutral bleaching. Ridge and Bowden *(14)* offer a rather extensive work on the subject of tensile strength and cuprammonium viscosity of chemically modified rayon and cotton yarns. Their investigations show very conclusively a definite relationship between the chemical and physical properties of these two substances.

M. L. Griffin *(15)* states that if a product, textile, or paper, is desired which will have reasonable permanence, the associated impurities and allied substances must be carefully removed with some risk of carrying the process too far, entailing faults and consequent losses. These are not always apparent, although they can be followed. Cellulose thus modified or degraded by over-treatment with oxidizing and hydrolyzing agents acquires cupric reducing properties as is indicated by means of the copper number since over-treatment with oxidizing and hydrolyzing agents increased the reducing power of the material and, hence, its copper number. He believes that this determination is the best measure available for diagnosing the chemical conditions of cellulose in numerical terms.

Parsons *(16)* says that the copper number is an expression of the oxidized, hydrolyzed, and otherwise degraded constituents of the pulp. He also states that the furfural values are indicative of the extent to which the cooking and bleaching processes have removed the pentosan constituents of the hemi-celluloses originally present in the wood. He also employs the dilute alkali solubility as a measure of the wood gum present.

According to Wenzel *(17)* the over-bleaching of fibers in a weakly alkaline, oxidizing solution is shown equally well by the copper number test or the determination of the fiber strength, but when the bleaching operation occurs in a strongly alkaline solution the alkali exerts a marked solvent action on the over-bleached fiber constituents. The resulting copper number is small, but the fiber strength is markedly decreased and in this case is regarded as a better test for the detection of bleach damages.

Baird and Doughty *(18)* show the effect of high bleach concentration and temperature on the pulp strength. Higher concentration and temperature tend to give lower strength.

Parsons *(19)* states that the fluidity of purified cellulose offers a favorable index of quality. It possesses the advantage over several of the other indices in that uniformly greater numerical differences are obtained. In the same article Parsons studies the relationship between chemical constants such as fluidity, alpha-cellulose, and copper number, and physical qualities, such as folding endurance and bursting strength of a sulphite pulp bleached in two stages, tests being made at various steps in the bleaching action. In general, he indicates that fluidity (reciprocal of viscosity) increases progressively except for a brief interval toward the end of the first stage of the bleaching process when it is nearly constant. The bursting strength and folding endurance figures increase to a maximum, corresponding closely to the completely bleached pulp, and there after decline owing to overbleaching and consequent deterioration in the physical properties of the fibers. At the period in the process when the desired bleached pulp was obtained, the copper number was at a minimum and the alpha-cellulose content was nearly constant, although further treatment continued to increase the fluidity. Even after an exposure of the pulp to a bleach liquor for five hours at 14 per cent concentration, the copper number was increased by only 0.9 unit, and the alpha-cellulose content reduced by 1.6 per cent, while the bursting strength and folding endurance were decreased by 13 and 575 units respectively. The fluidity increased, however, from about 14 for the bleached pulp to 18, a change of 4 units. In interpreting physical and chemical constants of cellulosic material a knowledge of the source of the fibers and their treatment is essential.

Moore and Willets *(20)* in tests on kraft and bleached sulphite show that oven drying the pulp before beating lowered their rates of hydration and bursting strength and increased the tear values.

Ross, Mitchell, and Yorsten *(21)* investigating the relationship of pH, color, and bleaching characteristics find that in order to maintain a high viscosity at a good color the pH must be maintained well on the alkaline side, approximately a pH of 8.5 to 10.

Reuben *(22)* studied the relationship between the viscosity test of bleached sulphite pulps from various sources. He found that in general the test can be applied only on comparing pulps from the same source. He found strong West Coast pulps with low viscosity and, conversely, mediocre western pulps with extremely high viscosities. Viscosity of bleached spruce cannot be fairly compared with hemlock or jack pine. He also found that pulps of high or low chlorine number may have the same viscosity and that pulps of different viscosity may have nearly the same characteristics on the paper machine.

Jarrell, Hankins, and Vietch *(23)* carried out a rather comprehensive study of the effect of inorganic acids on the physical properties of waterleaf rag bond paper. In general, they find that small quantities of aluminum sulphate, sulphuric acid or hydrochloric acid in paper caused its rapid deterioration, this deterioration increasing as the quantity of these materials is increased. Hydrochloric acid caused greater and more rapid degradation than did the sulphuric acid or aluminum sulphate. When the pH of the water extract from the paper was 5.1 the loss in folding endurance on heating was less than 20 per cent. The folding endurance, bursting strength, and tensile strength rapidly and progressively decreased as the pH of the water extracts of the trial samples decreased. The folding endurance of the paper was decidedly more affected by acidity. Of the three tests the folding endurance yielded the most significant results as to the effect of mineral acid on this paper.

Bentzen *(24)* states that the presence of chlorine in the stuff will cause a breakdown of the cellulose when the paper passes over the hot driers resulting in low strength papers.

Richter *(25)* in an investigation on the durability of purified wood fibers states that sulphite papers suffer appreciable deterioration when subjected to an artificial ageing test. High quality rags and purified wood fibers retain much of their original physical strength when subjected to the same tests. Oxygen is an important element in the decomposition of paper that is aged. Oxidation is hastened by increased temperature or by increased pressure. The effect of light at room temperature is less severe in its action on cellulose than the action of oxygen at somewhat elevated temperatures. The degree of hydration of a purified wood fiber does not influence the retention or flexibility of paper that is artificially aged, even when the fibers have been drastically beaten. Sulphite papers, on the other hand, are rendered much more sensitive and sacrifice increasing percentages of their original folding endurance since the pulp is hydrated more severely.

Winkler *(26)* discusses the action of acid on paper showing that acids at great dilution cause injury by loss of tearing and tensile strength. Contrary to others he finds that sulphuric acid causes greater injury than hydrochloric acid.

Hoffman *(27)* states that sulphite cellulose and paper undergo a chemical change upon being dried. This begins at about 90 degrees, increases considerably above 100 degrees, and is dependent on the time and temperature of the heating. This change renders the cellulose more easily attacked by the acid.

According to Starke *(28)* jute cooked with strong alkali shows greater tendency to change during storage than that cooked with weak alkali. There is a progressive change in the pulp during storage and this can be used to good advantage if the product is used at the right time.

Fikenscher *(29)* has shown that cellulose can be classified by means of its copper number and viscosity and has measured the effect of light and various reagents on cellulose.

Kohler *(30)* exposed paper to light and found that the copper number increased even when exposed to diffused light. The change in copper number seems to be related to a change of acidity in the paper.

Smit and Peper *(31)* investigating the strength and copper number relationships, state that a definite copper number does not always correspond with the same loss in strength. The copper number probably agrees better when the material is treated after attack with alkaline solution. He would use this test to replace the determination of the viscosity.

Rasch *(32)* in a very extensive piece of work on purified wood fibers studied the effect of accelerated ageing tests on the physical and chemical qualities of papers made from various types of fibers such as new rags, purified wood sulphite pulp, and soda pulp. From his observations he concluded that accurate evaluations of paper, or the suitability of a pulp or half-stuff for a certain type of paper can be based on observations as to their performance under specified tests. Fiber composition cannot be taken as a criterion of the excellence of a paper, although it seems desirable to have alpha content of paper for permanent use as high as possible, conclusions based on this determination alone may be in error due to the fact that the non-alpha constituents of different types of fibers vary in the extent to which they influence the permanence qualities of these fibers. The decrease in the alpha-cellulose content of a cellulose material caused by

artificial ageing is considered an indication of relative permanence. Purified wood pulps resemble the best grades of rag half-stock in suffering but slight change in alpha-cellulose after 72 hours at 100 deg. C. and these changes are accompanied by fairly proportionate changes in physical properties. Ordinary grades of sulphite pulps must be considered unsuited for conversion into highly permanent types of papers as high degree of hydration appears to be detrimental to the permanence of a paper.

Hibbert and Parsons *(33)* studying the oxidation of cellulose, state that over-bleaching of cellulose fibers or prolonged action of oxidizing agents in general lead to degradation of the fibrous structure. Physically the resulting material is found to have suffered a loss in weight and in strength, chemically it is not as resistant to the solvent action of aqueous alkaline solutions. Cotton cellulose when oxidized in acid solutions contains a larger amount of oxidized materials than when oxidized in either neutral or alkaline solution. The ash, copper number, alkali solubility, and pentosans have higher values in the case of cellulose oxidized in acid solutions. The viscosity of the cuprammonium hydroxide solutions of the various oxidized celluloses is much lower than those of the original product.

Moore and Hibbert *(34)* studies the action of sulphurous acid of 0.1-0.5—1.0-2.0 and 4.0 per cent concentration on a standard cellulose prepared according to the American Chemical Society method, and a commercial bleached sulphite pulp of high alpha-cellulose content and fairly low viscosity. They report that at 30 deg. C. the change in concentration of the acid caused a marked decrease in the viscosity but has no effect on the alpha-cellulose value and copper number. At 100 deg. C., on the other hand, a change in the concentration does not affect the viscosity but does affect the alpha-cellulose value and copper number. The explanation of this fact is probably found in the hydrogen ion relationship. There being a marked decrease in the hydrogen ion activity of the sulphurous acid solutions as the temperature increases. At 55 deg. C., the temperature effect comes into play. This phenomenon indicates that the change in viscosity is due perhaps on one hand to initial breaking down of micelles and, on the other, as the temperature increases, to the breaking of the glucosidic oxygen linkages.

Statement of the Problem

In an organized piece of research of this type some criterion must necessarily be selected whereby variations in the product studied can be definitely noted and organized. As an indication of the alteration in the nature of the cellulose micelle the cuprammonium viscosity test seems to offer the most value. The content of the so-called resistant cellulose is followed by means of the alpha-cellulose content. Finally, the presence of degradation products or groups is determined by the copper number determination.

Therefore, the regular procedure was to take a high grade rag half-stock, a high grade spruce Alpha pulp, and a bleached Mitscherlich sulphite pulp, determine the initial physical qualities including beating strength by means of the ten pound beater as well as the one and one-half pound Valley Iron Works beater, tear, fold, mullen and tensile strengths and in addition, the initial chemical properties such as cuprammonium viscosity, copper number, and alpha-cellulose content. The three selected stocks were then degraded under definite conditions of temperature, concentration, and consistency, to viscosities of two-thirds, one-half, and one-third the original values. The above mentioned physical and chemical values were then redetermined on the above mentioned stocks at these given degrees of degradation.

Physical and Chemical Tests and Methods of Reporting

1. Cuprammonium viscosity is determined by means of TAPPI Standard T 206m *(35)* the viscosity value being reported in centipoises.

2. Alpha-cellulose content is determined by the TAPPI Standard T 203m *(36)*.

3. Copper number is determined by means of the Schwalbe-Braidy method *(37)*.

4. Beating procedure (a) Rag half-stock. The blue denim rag half-stock in each instance was beat in a ten pound beater under the following conditions: With the roll raised twelve turns by means of the lighter bars the beater was charged with 6.5 pounds of half-stock at 2.75 per cent consistence. To facilitate the preparation of rag half-stock hand sheets there was added two and one-half per cent rosin size on the basis of dry stock and sufficient alum to bring the liquid contents of the beater to a pH of 5.5. Samples of stock were removed at intervals of 0, 20, 40, 60, 90, 120, and 150 minutes from the beginning of the beater run. Hand sheets were made on the Williams sheet forming apparatus under standard specified conditions. The resultant hand sheets were then properly seasoned at 65 per cent relative humidity and 70 deg. F., for a period of at least 24 hours previous to testing. (b) Alpha pulp and bleached Mitscherlich pulp. These pulps were beat in the one and one-half pound Valley Iron Works beater, the charge consisting of 400 grams of bone dry stock, 20.6 liters of water, and eighteen pounds placed on the bedplate lever. Samples of stock for physical tests were removed at 15 minute intervals, and made into hand sheets by the regular Valley procedure. The hand sheets were properly seasoned at 65 per cent relative humidity and 70 deg. F., previous to all physical testing.

5. Mullen test. Determined by means of the B. F. Perkins Automatic Mullen tester, all figures being determined as follows:

$$\frac{\text{Pop Test} \times 100}{\text{Basis Weight}} = \text{Per cent Mullen}$$

6. Freeness test. Determined by means of the automatic Schopper freeness tester, all results being the number of cubic centimeters draining from the side tube when using a two gram sample of stock diluted to one liter.

7. Fold test. Determined by means of the Schopper fold tester. All results are reported as the actual number of double folds.

8. Tear test. Determined by means of the Elmendorf tear tester. All results being reported as follows:

$$\frac{\text{Tear 16 sheets} \times 100}{\text{Basis Weight}} = \text{Tear Factor}$$

9. Tensile test. Determined by means of the Schopper tensile tester using a strip five inches long and fifteen mm. wide. All tests are reported as follows:

$$\frac{\text{Tensile test (lbs.)} \times 100}{\text{Basis Weight}} = \text{Tensile Factor}$$

The trade-size used in all basis weight computations was 24 x 36—480 and all hand sheets were of approximately 45 pound weight. Both physical and chemical results are average tests, the number of individual tests depending on the test itself. All chemical tests were run in duplicate. All beater runs were made in duplicate.

Preparation and Method of Degradation of Various Pulps

1. Heat degradation. Rag half-stock, Alpha pulp, and bleached spruce Mitscherlich pulps were heat-degraded in a large oven at 105 deg. C., for time intervals required to attain the predetermined viscosity test.

2. Acid degradation. Rag half-stock, Alpha, and bleached spruce Mitscherlich pulps were degraded with

sulphuric acid of two per cent concentration at five per cent consistency and 25 deg. C., for time intervals required to attain the predetermined viscosity tests.

3. Calcium hypochlorite bleach degradation. Rag half-stock, alpha, and bleached spruce Mitscherlich pulps were degraded with calcium hypochlorite bleach liquor of a concentration of 5 grams per liter of chlorine at five per cent consistency and 25 deg. C., for time intervals required to attain the predetermined viscosity tests.

Experimental

From Tables I and II, it is to be noted that the three standard pulps under consideration represent three degrees of chemical purity and differ very markedly in physical characteristics.

TABLE I.—CHEMICAL CONSTANTS OF STANDARD PULPS

	Viscosity	Alpha Cell	Beta Cell	Gamma Cell	Copper Number	Pentosans
Rag	300.0	96.5	3.4	0.0	.105	.65
Alpha	34.1	89.2	3.5	5.2	.97	6.00
Mitscherlich	24.2	82.7	7.8	9.0	2.72	10.70

TABLE II.—BEATING STRENGTH TESTS ON THE STANDARD PULPS

	Freeness at Max. Mullen	Max. Fold	Tear Factor at Max. Mullen	Per Cent Mullen	Max. Tensile Factor
Rag	445	385	300	90	27.0
Alpha	277	2145	125	100	33.8
Mitscherlich	387	508	91	104	39.0

Definite degrees of purity of the three pulps in terms of chemical quality is evident from Table 1. The blue denim rag half-stock consists essentially of resistant cellulose. From the high viscosity value it can be concluded that the molecular structure has been altered but slightly during the preparation of the stock from the original rags. The Alpha and Mitscherlich pulps differ considerably from the rag half-stock in their high content of pentosan material. Whether or not this material is an integral part of the cellulose molecule or of the non-cellulose portion of the fiber structure is open to question. It would seem that from the standpoint of resistance to degradation and permanence quality the rag half-stock would be far superior to the wood cellulose pulps.

In the case of physical properties we note a decided lack of uniformity insofar as single tests are concerned. At the outset we must state that it is impossible to compare the maximum or minimum physical properties of the rag half-stock on the one hand with those of Alpha and Mitscherlich since the method of refining and preparation of the hand sheets radically different in the two cases. Nevertheless, we can compare the Alpha and Mitscherlich pulps in these respects. Though this is considered to be a good grade of commercial Alpha pulp the data shows that it is superior to the Mitscherlich in some respects and in others it is inferior. The Mitscherlich possesses higher mullen and tensile strengths than the Alpha, but is inferior to the Alpha in tear and fold. It would appear that the drastic purification action used in preparation of the Alpha pulp enhances certain physical qualities, but impairs others.

1. At given intervals of degradation as indicated by the viscosity tests: Alpha-cellulose and copper number tests were made on the three stocks. With the viscosity test these latter two properties are possibly the most authentic indicators of the condition of the cellulose micelle. Oxidation or hydrolysis can be ascertained by solubility in alkali or reducing property due to aldehyde formation. In Table III, we have listed the relative effects of the three agents on the alpha-cellulose and copper number of the three stocks at the three degrees of viscosity previously mentioned. A survey of this table shows a certain definite regularity in the case of the wood cellulose with acid hydrolysis causing least change in alpha-cellulose content and

TABLE III.—EFFECT OF VARIOUS DEGRADING AGENTS ON THE CHEMICAL CONSTANTS OF THE THREE STANDARD STOCKS.

	Rag Half-Stock			Alpha Pulp			Mitscherlich	
Viscosity	200	100	20	25	15	7	15	7
Alpha Cellulose	acid bleach heat	acid heat bleach	heat acid bleach	acid bleach heat	acid bleach heat	acid bleach heat	acid bleach heat	acid bleach heat
Copper Number	bleach heat acid	acid heat bleach	heat acid bleach	acid bleach heat	acid bleach heat	acid bleach heat	acid bleach heat	acid bleach heat

copper number, and heat causing the greatest variation in these two constants. Insofar as the rag half-stock is concerned there seems to be a lack of regularity in the effectiveness of the agents. For the most part, changes in the chemical constants of the rag half-stock are slight as compared with those of the wood cellulose. Any changes due to degradation probably would take place on the cellulose micelle itself since the rag half-stock contains very few impurities, containing approximately 97 per cent alpha-cellulose. Apparently at complete degradation the hydrolysis and oxidation reactions of bleach liquor on rag half-stock result in greater changes in cellulose structure and, consequently, alpha-cellulose content and copper number.

2. Rate of degradation of the three standard pulps as evidenced by the viscosity test:

TABLE IV.—RATE OF DEGRADATION OF THREE STANDARD PULPS AS EVIDENCED BY THE VISCOSITY TEST

	Rag Half-stock			Alpha Pulp			Mitscherlich Pulp		
Time	Acid	Bleach	Heat	Acid	Bleach	Heat	Acid	Bleach	Heat
0	300	300	300	34.1	34.1	34.1	24.2	24.2	24.2
5 Min.	...	203	...	...	...	...	...	...	...
30 Min.	...	121	...	...	...	...	...	...	...
1 Hr.	...	...	...	...	...	...	...	...	...
4 Hr.	...	...	210	...	...	...	...	...	...
7 Hr.	...	...	...	...	...	...	...	12.5	...
8 Hr.	...	...	...	...	...	...	...	...	...
12 Hr.	...	...	...	...	...	...	...	8.1	...
24 Hr.	208	52	...	...	...	...	...	...	...
27 Hr.	...	...	152	...	...	...	...	...	...
48 Hr.	...	23	...	...	23.1	25.0	...	...	15.5
96 Hr.	...	...	...	24.5	...	...	...	...	...
102 Hr.	...	...	94	...	...	...	...	...	...
156 Hr.	155	...	...	...	...	...	...	...	...
288 Hr.	...	...	...	...	14.5	14.7	...	...	...
312 Hr.	...	...	47	...	...	...	...	...	...
384 Hr.	...	...	...	14.8	...	...	15.1	...	9.1
400 Hr.	...	...	27	...	...	...	...	...	...
672 Hr.	110	...	...	...	...	...	...	...	...
675 Hr.	...	...	...	...	...	...	8.0	...	...
700 Hr.	...	...	...	8.4	...	...	...	...	...
800 Hr.	...	...	...	...	9.6	9.0	...	...	...
1872 Hr.	25	...	...	...	...	...	...	...	...

Table IV indicates the viscosity values in centipoises, showing the rate of degradation of the three stocks under the definite conditions of treatment as previously specified; that is, sulphuric acid at two per cent concentration and five per cent consistency at 20 deg. C., calcium hypochlorite bleach at a concentration of five grams per liter of chlorine, at five per cent consistency and 20 deg. C., and heat at 105 deg. C. It is quite apparent that the various degrading agents alter the colloidal structure of the cellulose at different rates. The oxidizing and hydrolyzing action of the bleach solution on the cellulose micelle is quite rapid in the early stage. The dehydrating action of heat at 105 deg. C., is somewhat slower in altering the structure of the cellulose. The sulphuric acid, at the concentration and temperature applied, is very slow in its degrading action. Of course, it must be remembered that the rate of the various reactions can be materially increased or decreased, depending upon the concentration and the temperature of the degrading agent.

3. Relation between viscosity and alpha-cellulose content of the three standard pulps:

Table V shows a numerical classification of the viscosity values and the alpha-cellulose content or alkali resistance of the three standard pulps. A few generalizations can be drawn from a survey of the table among which is the fact that high viscosity is indicative of high alpha-cellulose

TABLE V.—RELATION BETWEEN VISCOSITY AND ALPHA-CELLULOSE OF THE THREE STANDARD PULPS.

Viscosity	Rag Half-stock			Alpha Pulp			Mitscherlich Pulp		
	Acid	Bleach	Heat	Acid	Bleach	Heat	Acid	Bleach	Heat
300	96.5	96.5	96.5	...	...	...	...	...	...
210	...	...	95.7	...	...	...	...	...	...
208	96.9	...	...	...	...	...	...	...	...
203	...	96.2	...	...	...	...	...	...	...
125	...	95.0	...	...	...	...	...	...	...
110	97.2	...	...	...	...	...	...	...	...
94	...	...	95.6	...	...	...	...	...	...
34.1	...	...	...	89.2	89.2	89.2	...	...	...
27	...	...	94.5	...	...	...	...	...	...
25	93.5	...	...	...	...	87.7	...	...	...
24.5	...	...	...	89.0	...	...	...	...	...
24.2	...	...	...	...	...	...	82.7	82.7	82.7
23.1	...	...	...	...	88.4	...	...	...	...
23.0	...	91.7	...	...	...	...	...	...	...
15.5	...	...	...	...	...	...	80.7	...	78.5
14.8	...	...	...	87.1	...	...	...	...	...
14.7	...	...	...	...	...	86.0	...	...	...
14.5	...	...	...	...	86.6	...	...	...	...
12.5	...	...	...	...	...	...	...	79.3	...
9.6	...	...	...	...	83.5	...	...	...	...
9.1	...	...	...	...	...	...	...	...	77.8
9.0	...	...	...	...	...	77.2	...	...	...
8.4	...	...	...	85.6	...	...	...	...	...
8.1	...	...	...	...	...	...	...	78.4	...
8.0	...	...	...	...	...	...	79.4	...	...

TABLE VI.—RELATION BETWEEN VISCOSITY AND COPPER NUMBER OF THE THREE STANDARD PULPS.

Viscosity	Rag Half-stock			Alpha Pulp			Bleached Mitscherlich		
	Acid	Bleach	Heat	Acid	Bleach	Heat	Acid	Bleach	Heat
300	.105	.105	.105	...	...	...	...	...	...
210	...	...	.121	...	...	...	...	...	...
208	.137	...	...	...	...	...	...	...	...
203	...	.105	...	...	...	...	...	...	...
125	...	.317	...	...	...	...	...	...	...
110	.148	...	...	...	...	...	...	...	...
94	...	...	.158	...	...	...	...	...	...
34.1	...	...	...	.97	.97	.97	...	...	...
27.0	...	...	.211	...	...	...	...	...	...
25.0	.423	...	...	...	...	1.16	...	...	...
24.5	...	...	...	1.04	...	...	...	...	...
24.2	...	...	...	...	...	...	2.72	2.72	2.72
23.1	...	.624	...	...	1.09	...	...	...	...
23.0	...	...	...	...	...	...	...	...	...
15.5	...	...	...	...	...	...	2.77	...	2.96
14.8	...	...	...	1.21	...	...	...	...	...
14.7	...	...	...	...	...	1.66	...	...	...
14.5	...	...	...	...	1.40	...	...	...	...
12.5	...	...	...	...	...	...	...	2.90	...
9.6	...	...	...	...	1.71	...	...	...	...
9.1	...	...	...	...	...	...	...	...	3.11
9.0	...	...	...	...	...	2.25	...	...	...
8.4	...	...	...	1.24	...	...	...	...	...
8.1	...	...	...	...	...	...	...	2.98	...
8.0	...	...	...	...	...	...	2.84	...	...

content or considerable resistance toward 17.5 per cent caustic soda. It is also quite apparent that in general a decrease in viscosity by any of the degrading agents causes a similar decrease in the alpha-cellulose content of each of the pulps. One notable exception to this latter statement is acid degradation of the rag half-stock in initial stages. This possibly can be explained by assuming that the acid hydrolysis alters the cellulose micelle in such a manner as to form simpler polymeric products which are still more resistant to the influence of sulphuric acid under the conditions stated. In the case of the alpha pulp and the Mitscherlich pulp we note a regular sequence insofar as the degrading effect of the various agents appears. It is quite evident in these two cases that for a given viscosity, heat causes the greatest loss in alpha-cellulose content, bleach the next, and sulphuric acid the least.

Upon examination of similar conditions for the rag half-stock we note a difference in the action of the various agents at given viscosities. In this case the oxidizing and hydrolyzing action of the bleach liquor caused the greatest loss in alpha-cellulose content, acid next, and heat least. Apparently the non-cellulosic constituents of the wood pulp in undergoing alteration by oxidation, hydrolization, and dehydration must interfere with the viscosity value. It is also quite apparent that, although the viscosity of the rag half-stock at complete degradation is practically as low as that of the wood cellulose, the alpha content is still maintained at a fairly high value. Also in undergoing a change in viscosity from maximum to minimum the percentage variation in alpha-cellulose content of the rag half-stock is less than that of the wood cellulose. Such tendencies lead one to assume that due to high viscosity the rag half-stock should be more resistant to any degrading influences.

4. Relation between Viscosity and Copper number of the three standard pulps:

In Table VI we note the relation between viscosity and copper number or in other words, the relation between the structure of the cellulose micelle and the presence of degraded products as indicated by the cupric reducing qualities of the pulp. As in the case of viscosity and alpha-cellulose we note a few general tendencies. Decrease in viscosity seems to indicate increase in copper number, or reducing qualities. In the case of the Alpha and Mitscherlich pulp, acid degradation causes the least increase in copper number, bleach next, and heat degradation the greatest increase. In considering the rag half-stock no general tendency seems to apply at given viscosities insofar as the effect of the degrading agents are concerned. At a viscosity of approximately 200, bleach causes the least increase in copper number and acid the greatest. A viscosity of 25 or complete degradation, heat causes the least increase in copper number, and bleach the greatest. Apparently, the combined hydrolytic and oxidizing action of the bleach liquor alters the cellulose molecule in such a manner that aldehyde groups are formed to a considerable extent, whereas the dehydration action of heat might cause the formation of simpler polymers yet with less reducing properties than that of the bleach degradation. Here also as in the case of the viscosity and alpha-cellulose relationship, at complete degradation of rag half-stock the copper number is still much less than the copper number of the Alpha or Mitscherlich at a similar viscosity. Higher reducing properties of the wood celluloses are in all probability due to pentosan and other constituents other than the cellulose. It is conceivable that there are instances where the copper number is not a true indication of extent of degradation. In an oxidation degradation it is possible that the alcoholic hydroxyl groups could pass completely degraded cellulose with little, if any, reducing properties.

5. Relation between alpha-cellulose and copper number of three standard pulps:

A survey of the relationship between alpha-cellulose content or alkali resistance and copper number or reducing properties, as shown in Table VII, yields some interesting observations insofar as the three stocks and the methods

TABLE VII.—RELATION BETWEEN ALPHA-CELLULOSE AND COPPER NUMBER OF THE THREE STANDARD PULPS.

Alpha Cellulose	Rag Half-stock			Alpha Pulp			Bleached Mitscherlich		
	Acid	Bleach	Heat	Acid	Bleach	Heat	Acid	Bleach	Heat
97.2	.148	...	...	...	...	...	...	...	...
96.9	.137	...	...	...	...	...	...	...	...
96.5	.105	.105	.105	...	...	...	...	...	...
96.25	...	.105	...	...	...	...	...	...	...
95.75	...	...	.121	...	...	...	...	...	...
95.68	...	...	.158	...	...	...	...	...	...
95.00	...	.317	...	...	...	...	...	...	...
94.50	...	...	.211	...	...	...	...	...	...
93.50	.423	...	...	...	...	...	...	...	...
91.70	...	.624	...	...	...	...	...	...	...
89.20	...	...	...	.97	.97	.97	...	...	...
89.00	...	...	...	1.04	...	...	...	...	...
88.40	...	...	...	...	1.09	...	...	...	...
87.70	...	...	...	...	...	1.16	...	...	...
87.10	...	...	...	1.21	...	...	...	...	...
86.60	...	...	...	...	1.40	...	...	...	...
86.00	...	...	...	...	...	1.66	...	...	...
85.60	...	...	...	1.24	...	...	...	...	...
83.50	...	...	...	...	1.71	...	...	...	...
82.70	...	...	...	...	...	...	2.72	2.72	2.72
80.70	...	...	...	...	...	...	2.77	...	...
79.40	...	...	...	...	...	...	2.84	...	...
79.30	...	...	...	...	...	...	...	2.90	...
78.50	...	...	...	...	...	...	...	...	2.96
78.40	...	...	...	...	...	...	...	2.98	...
77.80	...	...	...	...	...	...	...	...	3.11
77.20	...	...	...	...	...	2.25	...	...	...

of degradation are concerned. Here also we note a general tendency of the copper number to increase as the alpha-cellulose content decreases. We note also that in the case of the rag half-stock at complete degradation, as evidenced by the viscosity test, the copper number is less than that for the non-degraded bleached Mitscherlich pulp. Indications are that for the three stocks in passing from the original state to complete degradation the rag half-stock undergoes the greatest alteration in copper number, the alpha-cellulose next, and the Mitscherlich pulp least. There is a possibility that in the case of the rag half-stock, the reducing action is due entirely to alteration in the cellulose micelle whereas in the case of the Alpha and the Mitscherlich pulp the increasing reducing properties may be, for the most part, due to alteration of the constituents other than cellulose. It is highly probable that oxidation in the case of bleached Mitscherlich may have progressed to the acid state, thereby giving an unusual relationship between copper number and state of degradation.

6. Relation between Viscosity and strength of the three standard pulps; each degraded by different agents to given viscosity:

In Tables IX - XI inclusive, we have listed the actual beating strength values of the three standard pulps degraded to various degrees of viscosity by means of the three selected degrading agents. There is a regular decrease in physical strength properties including Mullen, fold, tear, and tensile with decrease in the viscosity of the cellulose. In other words, alteration in micellar structure of the cellulose unit caused by degrading agents is reflected in the decrease of the properties of hand sheets prepared from the beaten stock.

There is to be noted a certain regularity in the degrading influence of the various reagents on the three standard stocks. In other words, the extent of degradation is dependent directly upon the chemical action of these agencies.

Table VIII, which is a summary of Tables XI - XXXV inclusive, and indicates certain tendencies as regards the standard pulps and their reaction to the degrading agents under the conditions specified. There is in the case of bleached Mitscherlich pulp, Alpha pulp and rag half-stock, at complete degradation, a regularity of effect of alteration on the mullen, fold, tear, and tensile strengths. It appears that under the conditions studied, acid hydrolysis causes the least loss in physical strength, calcium hypochlorite bleach solution next, and heat the greatest. On the other hand, the degrading agents exhibit a reversal of effectiveness in the case of the rag half-stock at slight and intermediate viscosities. Evidently, at a viscosity of 200, although the micellar structure has been changed somewhat, the dehydrating action of heat causes least loss in strength, and acid the greatest. This may be tied up somewhat with the rate of alteration. There is a very rapid change in viscosity of rag half-stock during the initial stages of degradation and heat tends to cause this change at a much more rapid rate than acid. Apparently, the long exposure to acid, under the conditions stipulated, for a viscosity change of from 300 to 200 has more effect on the physical properties of the cellulose than a short exposure to heat which causes the same viscosity change.

At complete degradation, or low viscosity, the hydrolysis of depolymerization action of sulphuric acid under the conditions stipulated, is least effective on the strength properties of hand sheets prepared from the three standard stocks, the combined hydrolysis and oxidation action of calcium hypochlorite bleach solution tend to bring about a greater loss in physical strength; and the action of heat, which may cause complete disruption of the cellulose micelle, effects the greatest loss in strength. Retention of physical strength of hand sheets is also possible due to an adhesive force of water of hydration of the cellulose fibers. Having once expelled water of hydration and capillary water from the cellulose fibers by means of heat, it is impossible to wet the fibers to the same degree had they not been dried; therefore, the adhesive force of capillary or colloidally bound water is sacrificed.

Since it has been established that under the conditions of degradation acid causes least loss of physical strength and heat the greatest, it is questionable what the effect of other concentrations of reagents and degrees of heat would have on these strength properties. The same relation might hold or the intensity of the reaction between cellulose and the degrading agent might be such that the order of influence might be altered somewhat.

TABLE VIII.—EFFECT OF VARIOUS DEGRADING AGENTS ON STRENGTH TESTS OF RAG HALF-STOCK, ALPHA PULP, AND BLEACHED SPRUCE MITSCHERLICH AT VARIOUS VISCOSITIES

Rag Half-stock			Alpha			Mitscherlich	
200	100	20	25	15	7	15	7
Mullen							
Heat	Acid	Acid	Acid	Acid	Acid	Acid	Acid
Bleach	Heat	Heat	Bleach	Bleach	Bleach	Bleach	Bleach
Acid	Bleach	Bleach	Heat	Heat	Heat	Heat	Heat
Fold							
Heat	Heat	Acid	Acid	Acid	Acid	Acid	Acid
Bleach	Bleach	Heat	Bleach	Bleach	Bleach	Bleach	Bleach
Acid	Acid	Bleach	Heat	Heat	Heat	Heat	Heat
Tear							
Heat	Heat	Acid	Acid	Acid	Acid	Acid	Acid
Bleach	Bleach	Heat	Bleach	Bleach	Bleach	Bleach	Bleach
Acid	Acid	Bleach	Heat	Heat	Heat	Heat	Heat
Tensile							
Acid	Acid	Acid	Acid	Acid	Acid	Acid	Acid
Heat	Bleach	Heat	Heat	Bleach	Bleach	Bleach	Bleach
Bleach	Heat	Bleach	Bleach	Heat	Heat	Heat	Heat

TABLE IX—EFFECT OF DEGRADATION IN THE RELATION BETWEEN STRENGTH OF RAG HALF-STOCK AND THE VISCOSITY VALUES

Viscosity	Freeness at Max. Mullen	Maximum Fold	Tear Factor at Max. Mullen	Per Cent Mullen	Maximum Tensile Factor
Acid Degradation					
300	445	385	300	90	27.0
208	390	129	270	77	26.2
110	270	98	200	75	25.5
25	250	84	192	72	25.0
Bleach Degradation					
300	445	385	300	90	27.0
200	380	285	272	83	25.1
123	330	133	232	70	23.0
23	300	49	170	58	20.6
Heat Degradation					
300	445	385	300	90	27.0
210	395	375	282	87	26.0
94	385	132	237	72	22.0
27	285	53	170	62	21.2

TABLE X.—EFFECT OF DEGRADATION IN THE RELATION BETWEEN STRENGTH OF ALPHA PULP AND THE VISCOSITY VALUES.

Viscosity	Freeness at Max. Mullen	Maximum Fold	Tear Factor at Max. Mullen	Per Cent Mullen	Maximum Tensile Factor
Acid Degradation					
34.1	277	2149	125	100	35.1
24.5	280	1825	112	93	33.8
14.8	280	1075	98	86	30.9
8.4	260	230	82	75	28.2
Bleach Degradation					
34.1	277	2149	125	100	35.1
23.1	287	1280	104	85	33.9
14.5	285	350	100	78	31.8
9.6	162	50	62	67	28.2
Heat Degradation					
34.1	277	2149	125	100	35.1
25.0	282	178	90	75	29.7
14.7	197	40	59	56	25.7
9.0	270	3	33	34	17.4

TABLE XI.—EFFECT OF DEGRADATION ON THE RELATION BETWEEN STRENGTH OF BLEACHED MITSCHERLICH PULP AND THE VISCOSITY VALUES

Viscosity	Freeness at Max. Mullen	Maximum Fold	Tear Factor at Max. Mullen	Per Cent Mullen	Maximum Tensile Factor
		Acid Degradation			
24.2	387	508	91	104	39.0
15.1	225	450	66	92	34.0
8.0	155	220	54	81	29.5
		Bleach Degradation			
24.2	387	508	91	104	39.0
12.5	230	382	53	80	30.0
8.1	145	65	43	72	26.5
		Heat Degradation			
24.2	387	508	91	104	39.0
15.5	265	165	59	67	27.2
9.1	175	6	30	36	18.7

7. Relation between Viscosity and strength of the three standard pulps degraded to the same Viscosity by the different agents:

In Tables XII - XIV, there is listed the relationship between the various strength properties of the three standard pulps and the methods of degradation, namely acid, bleach, and heat. In other words, we degraded three different stocks with a single degrading agent to definite viscosities to determine whether or not the strength properties were comparable. Again it is impossible to compare the results on rag half-stock with that of the wood pulps. This situation can be explained by the different methods of refining the two stocks and of the preparation of the hand sheets, the rag half-stock having been refined in a ten pound beater and sheets prepared on a William's sheet mold, while all work on the wood pulps was carried out on the Valley pulp testing equipment. If we compare the two wood pulp qualities, we note a general relationship between viscosity and strength, low viscosity indicating low strength and high viscosity, high strength. But even in this method of comparison there are discrepancies. It seems that the strength of a stock at a given viscosity is altered to a much greater extent by oven-aging than acid or bleach degradation. Nevertheless, it would appear that there is a potential relationship between these two properties of given stocks.

TABLE XII.—RELATION BETWEEN VISCOSITY AND STRENGTH OF THE THREE STANDARD PULPS—ACID DEGRADED

Pulp	Viscosity	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Mitscherlich	8.0	81	220	54	29.5
Alpha	8.4	75	230	82	28.2
Alpha	14.8	86	1075	98	30.9
Mitscherlich	15.1	92	450	66	34.0
Alpha	24.5	93	1825	112	33.8
Rag	25.0	72	84	192	25.0
Rag	110.0	75	98	200	25.5
Rag	208.0	77	129	270	26.2

TABLE XIII.—BLEACH DEGRADED

Pulp	Viscosity	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Mitscherlich	8.1	72	65	43	26.5
Alpha	9.6	67	50	62	28.2
Mitscherlich	12.5	80	347	53	30.0
Alpha	14.5	78	350	100	31.8
Rag	23.0	58	48	170	20.6
Alpha	23.1	85	1280	104	33.9
Rag	123.0	70	133	232	23.0
Rag	200.0	83	285	272	25.1

TABLE XIV.—HEAT DEGRADED.

Pulp	Viscosity	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Alpha	9.0	34	3	33	17.4
Mitscherlich	9.1	36	6	30	18.7
Alpha	14.7	56	40	58	25.7
Mitscherlich	15.5	67	165	59	27.2
Alpha	25.0	75	178	90	29.7
Rag	27.0	62	53	170	21.2
Rag	94.0	72	132	237	21.8
Rag	210.0	87	375	282	26.0

8. Relation between Alpha-Cellulose and strength of the three standard pulps:

Tables XV - XVII show the alpha-cellulose content or alkali resistance property of various types of cellulose and strength. Somewhat similar situation exists here as in paragraph seven. The rag half-stock method of hand sheet preparation interferes with any comparison that might be made. Here, also, we note a general tendency toward alpha-cellulose content relationship of the wood pulps and mullen, fold, tear, and tensile. Therefore, given three different pulps and degrading by a definite agent to a given viscosity we should expect some similiarity of physical quality in the resultant pulps.

9. Relation between Copper Number and Strength of the Three Standard Pulps:

TABLE XV.—RELATION BETWEEN ALPHA-CELLULOSE AND STRENGTH OF THE THREE STANDARD PULPS—ACID DEGRADED

Pulp	Alpha-Cellulose	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Mitscherlich	79.4	81	220	54	29.5
Mitscherlich	80.7	92	450	66	34.0
Alpha	85.6	75	230	82	28.2
Alpha	87.1	86	1075	98	30.9
Alpha	89.0	93	1825	112	33.8
Rag	93.5	72	84	192	25.0
Rag	96.9	77	129	270	26.2
Rag	97.2	75	98	200	25.5

TABLE XVI.—BLEACH DEGRADED

Pulp	Alpha-Cellulose	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Mitscherlich	78.4	72.3	65	43	26.5
Mitscherlich	79.3	80.7	382	53	30.0
Alpha	83.5	67.0	62	62	28.2
Alpha	86.6	78.0	249	100	31.8
Alpha	88.4	85.2	1280	104	33.9
Rag	91.7	58.0	49	170	20.6
Rag	95.0	70.0	133	232	23.0
Rag	96.2	83.0	285	272	25.1

TABLE XVII.—HEAT DEGRADED

Pulp	Alpha-Cellulose	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Alpha	77.2	34.4	3	33	17.4
Mitscherlich	77.8	36.0	6	30	18.7
Mitscherlich	78.5	67.5	165	59	27.6
Alpha	86.0	56.0	40	58	25.7
Alpha	87.7	75.0	178	90	29.7
Rag	94.5	62.0	53	170	21.2
Rag	95.6	72.0	132	237	21.8
Rag	95.7	87.0	375	282	26.0

Tables XVIII-XX, offer a picture of copper number or reducing properties of the cellulose and physical strength. There is an agreement between this characteristic and strength quality similar to that found in the case of viscosity and alpha-cellulose content. In other words, low copper number indicates high strength, and high copper number low strength. An apparent change in reducing properties due to aldehyde formation of the cellulose of constituents other than cellulose in the pulp is accompanied by a corresponding change in mullen, tear, fold, and tensile.

TABLE XVIII.—RELATION BETWEEN COPPER NUMBER AND STRENGTH OF THE THREE STANDARD PULPS—ACID DEGRADED

Pulp	Copper Number	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Rag	.137	77	129	270	26.2
Rag	.148	75	98	200	25.5
Rag	.423	72	89	192	25.0
Alpha	1.04	93	1825	112	33.8
Alpha	1.21	86	1075	98	30.9
Alpha	1.24	75	230	82	28.2
Mitscherlich	2.77	92	450	66	34.0
Mitscherlich	2.84	81	220	54	29.5

TABLE XIX.—BLEACH DEGRADED

Pulp	Copper Number	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Rag	.105	83	285	270	26.2
Rag	.317	70	133	232	23.0
Rag	.624	58	49	170	20.6
Alpha	1.09	85	1280	104	33.9
Alpha	1.40	78	349	100	31.8
Alpha	1.71	67	62	62	28.2
Mitscherlich	2.90	80	382	53	30.0
Mitscherlich	2.98	72	65	43	26.5

TABLE XX.—HEAT DEGRADED

Pulp	Copper Number	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Rag	.121	87	375	282	26.0
Rag	.158	72	132	237	21.8
Rag	.211	62	53	170	21.2
Alpha	1.16	75	178	90	29.7
Alpha	1.66	56	40	58	25.7
Alpha	2.25	34	3	33	17.4
Mitscherlich	2.96	67	165	59	27.6
Mitscherlich	3.11	36	6	30	18.7

10. Relation between Viscosity and Strength of Rag Half-Stock, Alpha Pulp, and Mitscherlich Pulp:

In Tables XXI - XXIII, we note the organized data relating to the strength of the three standard pulps when arranged in increasing viscosity values irrespective of method of degradation. In this instance we are interested in whether or not degradation of a given stock by various agents causes a regular or irregular alteration in strength. In general, it is evident that for the Rag half-stock, Alpha pulp, and bleached Mitscherlich pulp, there is a definite relationship between viscosity and strength irrespective of the agent used. One notable exception is the effect of heat. It would appear that in certain instances, although the viscosity is high, the heat has caused marked variations in physical quality.

TABLE XXI.—RELATION BETWEEN VISCOSITY AND STRENGTH OF RAG HALF-STOCK

Method of Degradation	Viscosity	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Bleach	23.0	58.0	49	170	20.6
Acid	25.0	72.0	89	192	25.0
Heat	27.0	62.0	53	170	21.2
Heat	94.0	72.0	132	237	21.8
Acid	110.0	75.0	98	200	25.5
Bleach	123.0	70.0	133	232	23.0
Bleach	200.0	83.0	285	272	25.1
Acid	208.0	77.0	129	270	26.2
Heat	210.0	87.0	375	282	26.0
Original	300.0	90.0	385	300	27.0

TABLE XXII.—RELATION BETWEEN VISCOSITY AND STRENGTH OF ALPHA PULP

Method of Degradation	Viscosity	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Acid	8.4	75	230	82	28.2
Heat	9.0	34	3	33	17.4
Bleach	9.6	67	50	62	28.2
Bleach	14.5	78	350	100	31.8
Heat	14.7	56	40	58	25.7
Acid	14.8	86	1075	98	30.9
Bleach	23.1	85	1280	104	33.9
Acid	24.5	93	1825	112	33.8
Heat	25.0	75	178	90	29.7
Original	34.1	100	2149	125	33.8

TABLE XXIII.—RELATION BETWEEN VISCOSITY AND STRENGTH OF MITSCHERLICH PULP

Method of Degradation	Viscosity	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Acid	8.0	81	220	54	29.5
Bleach	8.1	72	65	43	26.5
Heat	9.1	36	6	30	18.7
Bleach	12.5	80	347	53	30.0
Acid	15.1	92	450	66	34.0
Heat	15.5	67	165	59	27.2
Original	24.2	104	508	91	39.0

11. Relation between Alpha-Cellulose and Strength of Rag Half-Stock, Alpha Pulp and Bleached Mitscherlich Pulp:

In Tables XXIV - XXVI, we have listed those relations between each of the three standard pulp at various alpha-cellulose contents which were brought about by the three degrading agents previously mentioned. A general but none to well defined relationship exists in these instances as in the case of paragraph ten. High alpha content seems to indicate high strength. Low alpha content of a given stock, regardless of the method of causing same, points to a pulp of inferior strength quality. Here also are notable exceptions. In the case of Rag, half-stock, acid hydrolysis at high viscosity appears to have markedly affected the physical strength. Exceptions are noted in the case of heat degradation and a given viscosity. The dehydrating action of heat and possible oxidation seems to have reduced the physical qualities to points much lower than the other degrading agents, when degraded to the same alpha-cellulose content.

12. Relation between Copper Number and Strength of the Three Standard Pulps:

Tables XXVII-XXIX, show the results of physical properties of the three standard pulps and their relation to copper number or reducing quality resulting from treatment by the three agents mentioned. In this instance, there seems to be a rather precise regularity between cop-

TABLE XXIV.—RELATION BETWEEN ALPHA-CELLULOSE AND STRENGTH OF RAG HALF-STOCK

Method of Degradation	Alpha-Cellulose	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Bleach	91.70	58.0	49	170	20.6
Acid	93.50	72.0	89	192	25.0
Heat	94.50	62.0	53	170	21.2
Bleach	95.00	70.0	133	232	23.0
Heat	95.68	72.0	132	237	21.8
Heat	95.75	87.0	375	282	26.0
Bleach	96.25	83.0	285	272	25.1
Original	96.51	90.0	385	300	27.0
Acid	96.90	77.0	129	270	26.2
Acid	97.20	75.0	98	200	25.5

TABLE XXV.—RELATION BETWEEN ALPHA-CELLULOSE AND STRENGTH OF ALPHA PULP

Method of Degradation	Alpha-Cellulose	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Heat	77.2	34.4	3	33	17.4
Bleach	83.5	67.0	62	62	28.2
Acid	85.6	75.0	230	82	28.2
Heat	86.0	56.0	40	58	25.7
Bleach	86.6	78.0	249	100	31.8
Acid	87.1	86.0	1075	98	30.9
Heat	87.7	75.0	178	90	29.7
Bleach	88.4	85.2	1280	104	33.9
Acid	89.0	93.0	1825	112	33.8
Original	89.2	100.0	2149	125	33.8

TABLE XXVI.—RELATION BETWEEN ALPHA-CELLULOSE AND STRENGTH OF BL. MITCHERLICH

Method of Degradation	Alpha-Cellulose	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Heat	77.8	36.0	6	30	18.7
Bleach	78.4	72.3	65	43	26.5
Heat	78.5	67.5	165	59	27.6
Bleach	79.3	80.7	382	53	30.0
Acid	79.4	81.0	220	54	29.5
Acid	80.7	92.0	450	66	34.0
Original	82.7	104.0	508	91	39.0

per number and strength of the three stocks. Although, the real significance of the copper number test is sometimes questionable, each stock changes in quality in a regular progressive manner when subjected to the three previously mentioned degrading influences. Tensile, tear, fold, and mullen appear to be related to the copper number value. Here we need not consider the different methods of refining or sheet preparation of the different stocks, since we are comparing each stock itself with the three degrading agents.

TABLE XXVII.—RELATION BETWEEN COPPER NUMBER AND STRENGTH OF RAG HALF-STOCK

Method of Degradation	Copper Number	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Original	0.105	90	385	300	27.0
Bleach	0.105	83	285	270	26.2
Heat	0.121	87	375	282	26.0
Acid	0.137	77	129	270	26.2
Acid	0.148	75	98	200	25.5
Heat	0.158	72	132	237	21.8
Heat	0.211	62	53	170	21.2
Bleach	0.317	70	133	232	23.0
Acid	0.423	72	89	192	25.0
Bleach	0.624	58	49	170	20.6

TABLE XXVIII.—RELATION BETWEEN COPPER NUMBER AND STRENGTH OF ALPHA PULP

Method of Degradation	Copper Number	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Original	.97	100	2149	125	35.1
Acid	1.04	93	1825	112	33.8
Bleach	1.09	85.2	1280	104	33.9
Heat	1.16	75.0	178	90	29.7
Acid	1.21	86.0	1075	98	30.9
Acid	1.24	75.0	230	82	28.2
Bleach	1.40	78.0	249	100	31.8
Heat	1.66	56.0	40	58	25.7
Bleach	1.71	67.0	62	62	28.2
Heat	2.25	34.4	3	33	17.4

TABLE XXIX.—RELATION BETWEEN COPPER NUMBER AND STRENGTH OF BL. MITSCHERLICH

Method of Degradation	Copper Number	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Original	2.72	104	508	91	39.0
Acid	2.77	92	450	66	34.0
Acid	2.84	81	220	54	29.5
Bleach	2.90	80.7	382	53	30.0
Heat	2.96	67.5	165	59	27.6
Bleach	2.98	72.3	65	43	26.5
Heat	3.11	36.0	6	30	18.7

13. Relation between Viscosity and Strength of the Three Standard Pulps Irrespective of the Method of Degradation:

In Table XXX the data is arranged in such a manner as to compare viscosity and strength regardless of the pulp and method of degradation. In other words, if we consider a given pulp, degraded by some given agent

to given various viscosities do we have a corresponding relative change in physical quality? This table is most significant for in this manner a comparison would be made of commercial pulps. Are we justified in saying that a pulp of a certain viscosity should have a given strength value? In this table our conclusions must be limited to the wood pulp cellulose values since, as mentioned before, the method of refining and preparation of hand sheets in the case of wood pulp differed from that of the rag half-stock. Nevertheless, it is quite evident that here we find little or no tendency toward a relationship between viscosity and strength. Although the viscosity values are listed in increasing increments, the values listed for mullen, fold, tear, and tensile seem to fluctuate in a more or less haphazard manner, pointing to a very little regularity. It would appear, therefore, that changes in micellar structure due to oxidation, hydrolysis, or dehydration, or a combination of any or all, may affect the physical quality of hand sheets prepared from the cellulose in such a manner that values for mullen, tear, fold, and tensile are not related to viscosity.

TABLE XXX.—RELATION BETWEEN VISCOSITY AND STRENGTH OF THE THREE STANDARD PULPS REGARDLESS OF METHOD OF DEGRADATION

Pulp	Viscosity	Max. Mullen	Max. Fold	Tear at Max. Mullen	Max. Tensile
Mitscherlich	8.0	8.1	220	54	29.5
Mitscherlich	8.1	72	65	43	26.5
Alpha	8.4	75	230	82	28.2
Alpha	9.0	34	3	33	17.4
Mitscherlich	9.1	36	6	30	18.7
Alpha	9.6	67	50	62	28.3
Mitscherlich	12.5	80	347	53	30.0
Alpha	14.5	78	350	100	31.8
Alpha	14.7	56	40	58	25.7
Alpha	14.8	86	1075	98	30.9
Mitscherlich	15.1	92	450	66	34.0
Mitscherlich	15.5	67	72	59	27.2
Rag	23.0	58	49	170	20.6
Alpha	23.1	85	1280	104	33.9
Mitscherlich	24.2	104	508	91	39.0
Alpha	24.5	93	1825	112	35.1
Rag	25.0	72	89	192	25.0
Alpha	25.0	75	123	90	29.7
Rag	27.0	62	53	170	21.2
Alpha	34.1	100	2149	125	33.8
Rag	94.0	72	132	237	21.8
Alpha	110	75	98	200	25.5
Rag	123.0	70	133	23.2	23.0
Rag	200.0	83	285	272	25.1
Rag	208.0	77	129	270	26.2
Rag	210.0	87	375	282	26.0
Rag	300.0	90	385	300	27.0

14. Relation between Alpha-Cellulose and Strength of the Three Standard Pulps, regardless of the Method of Degradation:

Table XXXI indicates similar data to that listed in paragraph thirteen, with the exception that alpha-cellulose content, or alkali resistance, of the cellulose is compared with strength properties of the three types of cellulose when prepared in hand sheet form. As in paragraph thirteen, we are attempting to find a comparison between physical quality and alpha-cellulose content of three pulps degraded by three different agents to various degrees. Again, there is to be noted a decided irregularity between these two qualities of the three types of cellulose. The tabulated results seem to indicate that high alpha content does not necessarily mean high strength nor that low alpha content indicate low strength. It would seem, then, that the effectiveness of the three degrading agents varies with the type of stock and conditions of treatment insofar as physical strength and alpha content is concerned. A degrading agent my alter the alpha content but little, yet cause decided fluctuations in physical quality.

15. Relation between Copper Number and Strength of the Three Standard Pulps, regardless of the Method of Degradation:

Table XXXII, illustrates the relationship between value and strength quality of various types of cellulosic material when treated by the three degrading agents in question. As in paragraph thirteen and fourteen there seems to be no

TABLE XXXI.—RELATION BETWEEN ALPHA-CELLULOSE AND STRENGTH OF THE THREE STANDARD PULPS REGARDLESS OF METHOD OF DEGRADATION

Pulp	Alpha Cellulose	Max. Mullen	Max. Fold	Tear at Max. Mullen	Maximum Tensile
Alpha	77.2	34.4	3	33	17.4
Mitscherlich	77.8	36.0	6	30	18.7
Mitscherlich	78.4	72.3	65	43	26.5
Mitscherlich	78.5	67.5	165	59	27.5
Mitscherlich	79.3	80.7	382	53	30.0
Mitscherlich	79.4	81.0	220	54	29.5
Mitscherlich	80.7	92.0	450	66	34.0
Mitscherlich	82.7	104.0	508	91	39.0
Alpha	83.5	67.0	62	62	28.2
Alpha	85.6	75.0	230	82	28.2
Alpha	86.0	56.0	40	58	25.7
Alpha	86.6	78.0	249	100	31.8
Alpha	87.1	86.0	1075	98	30.9
Alpha	87.7	75.0	178	90	29.7
Alpha	88.4	85.2	1280	104	33.9
Alpha	89.0	93.0	1825	112	35.1
Alpha	89.2	100.0	2149	125	33.8
Rag	91.7	58	49	170	20.6
Rag	93.5	72	89	192	25.0
Rag	94.5	62	53	170	20.6
Rag	95.0	70	133	232	23.0
Rag	95.6	72	132	237	21.8
Rag	95.7	87	375	282	26.0
Rag	96.2	83	285	272	25.1
Rag	96.5	90	385	300	27.0
Rag	96.9	77	129	270—	26.2
Rag	97.2	75	98	200	25.5

correlation between reducing properties and physical strength when considering unlike types of pulps and various methods of degradation. In other words, given a pulp of certain copper number, or reducing property, we would be unable to anticipate the physical strength of hand sheets prepared from this pulp. In the three pulps mentioned, namely rag, Alpha, and bleached Mitscherlich sulphite, we note three decided degrees of copper number values, yet there is very little agreement between these values and mullen, tear, fold, and tensile. It would appear that insofar as viscosity, alpha-cellulose, and copper number values are concerned we would not be justified in stating that given a definite value for either we would necessarily expect a given strength value. Although the influence of a degrading agent on a given pulp under specified conditions is specific in nature, it is questionable what that same agent would do to a second pulp under similar circumstances.

TABLE XXXII.—RELATION BETWEEN COPPER NUMBER AND STRENGTH OF THE THREE STANDARD PULPS REGARDLESS OF METHOD OF DEGRADATION

Pulp	Copper Number	Max. Mullen	Max. Fold	Tear at Max. Mullen	Maximum Tensile
Rag	.105	90	385	300	27.0
Rag	.105	83	285	270	26.2
Rag	.121	87	375	282	26.0
Rag	.137	77	129	270	26.2
Rag	.148	75	98	200	25.5
Rag	.158	72	132	237	21.8
Rag	.211	62	53	170	21.2
Rag	.317	70	133	232	23.0
Rag	.423	72	89	192	25.0
Rag	.624	58	49	170	20.6
Alpha	.97	100	2149	125	33.8
Alpha	1.04	93	1825	112	35.1
Alpha	1.09	85	1280	104	33.9
Alpha	1.16	75	178	90	29.7
Alpha	1.21	86	1075	98	30.9
Alpha	1.24	75	230	82	28.2
Alpha	1.40	78	249	100	31.8
Alpha	1.66	56	4058	58	25.7
Alpha	1.71	67	62	62	28.2
Alpha	2.25	34	3	33	17.4
Mitscherlich	2.72	104	508	91	39.0
Mitscherlich	2.77	92	450	66	34.0
Mitscherlich	2.84	81	220	54	29.5
Mitscherlich	2.90	80	382	53	30.0
Mitscherlich	2.96	67	165	59	27.6
Mitscherlich	2.98	72	65	43	26.5
Mitscherlich	3.11	36	6	30	18.7

16. Relation between Physical and Chemical Properties of a Few Representative Domestic and Foreign Commercial Type Bleached Sulphite Pulps:

Table XXXIII, indicates values representing physical and chemical properties of commercial bleached sulphite pulps. The mullen test has been arbitrarily chosen as the basis of comparison of the various qualities simply because this represents probably the most widely applied characteristic. It would seem that there is but a slight

correlation between physical and chemical qualities. One must recognize the fact that a multiplicity of variables enter into consideration when attempting to compare pulps from various mills and different sections of the country. Inherent variables in the wood itself such as type, age, rate of growth, seasoning, and size of chip enter into the picture. In the digestion process we have direct cooking, indirect cooking, direct heating and circulation, indirect heating and circulation, and numerous ramifications of each of these systems. Numerous procedures for bleaching are used commercially such as, single stage hypochlorite, double stage hypochlorite, double stage chlorination, hypochlorite, three stages, the use of acids as brightening agents and, the use of anti-chlors, all of which tend to inflict their own influence on the resultant product. Drying processes include air drying, steam drying with or without vacuum, hot air, all at a variety of temperatures. It is hardly conceivable then that pulps on the market today should exhibit any similarity or correlation between their different physical and chemical characteristics.

TABLE XXXIII.—RELATION BETWEEN PHYSICAL AND CHEMICAL PROPERTIES OF A FEW REPRESENTATIVE AMERICAN AND FOREIGN BLEACHED SULPHITE PULPS

Pulp No.	Max. Mullen	Tear at Max. Mullen	Fold at Max. Mullen	Alpha Cellulose	Vis.	Cop. No.
1	78	120	100	82.1	10.0	4.82
Alpha	87	240	500	89.7	29.3	2.18
3	90	150	450	86.7	13.9	3.16
4	93	230	750	86.8	24.5	2.72
5	93	270	350	89.2	22.2	2.54
6	94	230	950	85.6	18.8	2.84
Alpha	97	300	1450	94.8	66.9	.86
8	99	200	1800	85.8	...	3.17
Alpha	100	230	850	92.8	54.0	.80
10	101	240	1200	90.4	20.5	2.60
11	103	230	2000	87.3	...	1.71
12	103	230	3550	85.4	40.4	2.23
13	105	240	800	89.9	16.0	2.29
14	105	270	3100	89.2	36.6	1.95
15	107	200	1050	89.8	18.6	1.24
16	107	190	1700	89.2	30.1	1.07
17	108	140	750	81.3	...	4.20
18	109	290	2500	89.0	45.0	1.90
19	112	170	1700	87.9	18.9	2.61
20	119	270	5600	86.0	24.2	2.43

General Summary

A study has been made of the relationship between certain chemical and physical qualities of three representative types of paper-making cellulosic materials. Blue denim rag half-stock, a commercial grade of spruce Alpha pulp, and a bleached Mitscherlich sulphite pulp were selected as the raw materials for treatment. Two per cent sulphuric acid at five per cent consistency, calcium hypochlorite bleach solution at five grams of chlorine per liter and five per cent consistency, and heat at 105 deg. C., were chosen as the degrading agents. Cuprammonium viscosity, alpha-cellulose content, and copper number constituted the chemical qualities studied. Mullen strength, fold, tear, and tensile were the physical properties considered.

The general procedure, as previously outlined, was to degrade the three representative pulps by the three agents mentioned to certain viscosities and then to note any correlation between chemical constants and physical properties of hand sheets prepared from the pulps in question beaten in the tub type laboratory beater.

The degree of degradation was followed by means of the cuprammonium viscosity test as it is assumed to offer the best indication of an alteration in the nature of the cellulose micelle.

A survey of the data outlined in the body of this thesis indicates certain directional tendencies which might be listed as follows:

1. As noted in the historical section of this thesis, a survey of the literature showed very little, if any, comprehensive work on physical and chemical relationship of commercial pulps. Certain problems have been studied such as a study of a single physical and chemical property.

2. The list of chemical constants and physical properties of the three standard pulps chosen indicate radically different chemical states and physical qualities. This being the usual condition in commercial pulps.

3. The rate of degradation of the three standard pulps as exemplified by the viscosity test exhibits a general tendency in that regardless of the degrading agent the viscosity rapidly decreases during the initial stages of degradation. Nevertheless, though the viscosity of the rag half-stock has decreased to a considerable extent, it is materially greater than that value given for the wood pulps.

4. The change in viscosity of the three pulps caused by acid, bleach, and heat degradation is accompanied by a regular alteration in the alpha-cellulose content of the three stocks.

5. The change in the viscosity of the three pulps caused by acid, bleach, and heat degradation is also accompanied by regular alteration in the copper number of the three stocks.

6. The change in alpha-cellulose content of the three pulps caused by acid, bleach, and heat degradation is accompanied by a regular alteration in the copper number of the three stocks.

7. The decrease in the viscosity of each of the three stocks when degraded by each of the three agents is in every instance followed by a corresponding decrease in mullen, fold, tear, and tensile strength.

8. Insofar as alpha-cellulose content and copper number is concerned, the same conclusions apply.

9. Disregarding the method of degradation and comparing viscosity and strength of each of the three pulps in question we note a general tendency toward correlation in that increase in viscosity is accompanied by increase in physical strength.

10. The results would seem to indicate that there is a definite relationship between the viscosity of a pulp and the fold. This seems to apply to all pulps irrespective of method of preparation.

11. Disregarding the method of degradation and comparing alpha-cellulose content and strength, and copper number and strength, we again note a general tendency toward the same correlation as mentioned in paragraphs nine and ten above.

12. Disregarding the type of pulp and method of degradation and comparing the viscosity test and physical quality we note a decided lack of correlation. In other words, given a certain pulp of known viscosity, we are not justified in anticipating its physical strength.

13. Considering alpha-cellulose content and copper number values in the same light as mentioned in paragraph twelve above, similar conclusions must be drawn regarding these values.

14. There appears to be little or no correlation between the physical and chemical properties of representative commercial bleached sulphite pulps.

15. It would appear that any relation between physical quality and chemical constants is specific and relative in nature, and dependent upon the elements of time, temperature, and concentration.

16. Under the conditions studied it would appear that a hydrolyzing action due to acids causes least alteration of physical strength, oxidation, and hydrolyzing action of bleach liquor causes greater loss in physical strength than does acid, whereas heat degradation possible due to dehydration, and subsequent rupture of the cellulose micelle, results in marked and greatest alteration of strength. One might further elaborate by stating that at a given temperature, increasing concentration of free sulphur dioxide, or

sulphurous acid in the digester will cause slight, if any, increase in degradation of the cellulose. Bleach plant operations are somewhat more sensitive than digester operations on a given sulphite cellulose. Heat, or the drying operation, on the other hand, markedly affects pulp strength quality. Any alteration in procedure immediately reflects itself by increase or decrease in physical strength of the pulp.

Conclusions

In drawing conclusions one must emphasize the complex conditions under which a study of this type must necessarily be conducted. First of all, we are dealing with three representative types of pulp which are decidedly different in certain respects. It has been the aim to reduce these pulps to a definite status as measured by one yard stick, the cuprammonium viscosity test. One is, therefore, forced to disregard any potential effect other constituents might exert upon the strength properties of the degraded pulps. Secondly, the method of degradation of the pulps would in some respects, especially as to time, temperature, and concentration of degrading agent, affect the results. Thirdly, the method of beating for the rag stock differed from that of the Alpha and Mitscherlich pulps.

It is quite apparent that the entire system is a complex one, and therefore, to a certain extent at least precludes the possibility of obtaining a wealth of definite logical conclusions. The inherent complex constituents other than cellulose in the various pulps react in a manner difficult to follow by means of the various physical and chemical methods available.

The hydrolyzing action of the dilute sulphuric acid may react in one way on the constituents other than cellulose and in another on the cellulose itself. A conception of the exact action of heat on cellulose and its constituents is quite theoretical. We assume that the heat first liberates bound water, absorbed or imbibed, and subsequently causes a dehydration of the cellulose micelle which may or may not result in depolymerization and subsequent loss in physical strength. Since the pulps are purified to some extent previous to degradation, we assume the action of the bleach liquor to be one of oxidation and hydrolysis, in which the cellulose is attacked directly.

The ramifications of this problem are so vast and extensive that one can hardly hope to establish all tendencies of facts. In general, certain tendencies have been noted and possible a few definite conclusions have resulted from this study.

1. Degradation of various types of pulps by different degrading agencies can be followed by means of the cuprammonium viscosity test.

2. Changes in cuprammonium viscosity is invariably accompanied by a decided alteration in physical and chemical properties of pulp in general.

3. Under similar conditions of preparation or treatment there seems to be a definite relation between viscosity and the fold quality of various types of pulps.

4. Any relation between physical and chemical properties of various types of pulps on the one hand, and methods of degradation, or degrading agents, on the other, is specific and relative in nature, in other words, any statement as to correlation between physical and chemical properties and degrading influences must be amplified by a description of the given type of pulp, the specific degrading agent, and conditions of degradation, such as time, temperature, and concentration.

5. Under the conditions of time, temperature, and concentration, and consistency studied, it would appear that of the three degrading agents chosen, acid causes least alteration of physical and chemical qualities of cellulose, bleach next, and heat the greatest change in the given qualities.

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Fort Wayne Paper Co. Elects Officers

FORT WAYNE, Ind., March 9, 1936—All officers and directors of the Fort Wayne Corrugated Paper company were re-elected for another year at the annual meeting. Saturday at the company's offices in the Medical Arts building.

Officers are Henry J. Bowerfind, president; F. P. Koester, vice-president and treasurer, and Harold M. Treen, secretary. Directors re-elected include the officers and James M. Barrett, Jr., James H. Haberly, August E. C. Becker and George Stevens.

A successful report for 1935 was issued at the session. Prospects for the coming year are encouraging, it was said.

Pulp and Paper Industry Literature Review

Abstracts of Articles and Patents Compiled by the Abstracts and Bibliography Committee of the Technical Association of the Pulp and Paper Industry, A. Papineau-Couture, John F. Ohlson, C. E. Peterson and Clarence J. West, Chairman

Copies of United States Patents can be obtained from the United States Patent Office, Washington, D. C., for 10 cents each. Send currency, not stamps.

Alkaline Processes

Recovery of Organic Constituents Present in Soda Black Liquor. R. H. McKee. Brit. pat. 427,894 (Oct. 28, 1933).—Concentrated black liquor is fused with caustic potash at 200° to 230° C. for 2 hours, extracted with water, and sodium oxalate removed by crystallization. The liquor is then treated with oxalic acid to separate crystalline potassium acid oxalate, and is finally distilled to recover acetic acid. The residual liquor and also the sodium oxalate and the potassium acid oxalate are treated with slaked lime to yield calcium oxalate and caustic soda and caustic potash for re-use.—A. P.-C.

Carbonization of Black Liquor. L. Kalb and E. Strupp. Brit. pat. 425,899, (Aug. 25, 1933).—Liquor is concentrated and mixed with a powdered solid residue obtained in the process; the mixture is briquetted and carbonized by direct contact with hot combustion gases. After separation of the condensable volatile products (acetone, methanol, tar, etc.) the gases evolved are burned to produce hot combustion gases. The solid product may be burned under a boiler and the residue then returned to be mixed with a further supply of lye.—A. P.-C.

"Floating Soap." Paul Hodges assignor to Gulf States Paper Corp. U. S. pat. 1,992,949, (March 5, 1935).—A suspension agent suitable for use in a flotation process, such as in treating sulphide or oxide minerals, comprises "floating soap" obtained as a floating scum from soda or sulphate black liquor.—A. P. -C.

Device for the Air-Cooled Forms for Soda Smelt Ovens. H. E. Johansson, Stockholm. Swed. pat. 82,-261, (Dec. 24, 1932).—J. F. O.

Odor Troubles from Waste Gases and Their Removal. Wochbl. Papierfabr. 66, No. 8: 149, (Feb. 23, 1935).—By treating the obnoxious gases with chlorine, the odor is practically entirely removed. The quantity of chlorine required is only one eighth the theoretical amount necessary for the oxidation of the hydrogen sulphide which seems to indicate that there is a selective oxidation taking place.—J. F. O.

Process for the Purification of Sulphate Turpentine. S. H. Ledin, Stockholm. Finn. pat. 16,154 (Dec. 8, 1932).—The mercaptans and other sulphur compounds are first removed from the ray turpentine which is then subjected to continuous distillation in a column with steam or a permanent gas at a temperature so low that an appreciable polymerisation of the impurities in the turpentine does not take place. Fractionation then takes place and the distillation continued in a second column.—J. F. O.

Modern Recovery Furnaces in the United States. C. R. Blomstedt. Svensk Pappers-Tidn. 38, no. 12:385-386, 388-389 (June 30, 1935).—Description of the construction and operation of the Wagner furnace and several of its modifications.—C. J. W.

The Lime Sludge from Sulphate Mills. L. Lindblad. Finnish Paper and Timber J. 17, no. 12:558, 590-591 (June 30, 1935).—The economical aspects of different possibilities for utilizing the lime sludge resulting from sulphate mill operation are reviewed, such as calcining, eventually in the form of briquets and recovery of quicklime, as agricultural fertilizer, for the manufacture of cement, in the acid towers of the sulphite industry in place of limestone, in the glass industry and for neutralizing the waste liquor in the manufacture of sulphite alcohol. The author's personal opinion is that the applications as cement and fertilizer offer the best chances for large scale disposal of this by-product. —C. J. W.

Heat Economy in the Recovery System of Sulphate Mills. G. F. Heikel. Finnish Paper and Timber J. 17, no. 10:502, 504-506, 508-510 (May 31, 1935).—Heikel compares the efficiency of different evaporator systems and arrives at the conclusion that the Sandberg-Sundblad system with the quadruple effect evaporators is the most economical in operation. The overall thermal efficiency in Finnish sulphate mills is on the average not more than 40 per cent; this could be increased to 60 per cent by keeping the heating surfaces cleaner, preventing leaks in the rotaries and improving the combustion conditions.—C. J. W.

Sulphite Process

New Milk of Lime Method for the Absorption of Sulphur Dioxide. Finnish Paper and Timber J. 17, No. 8:418, 420-422 (April 30, 1935).—A review of the article by K. Veinov (Bumazhnaya Prom. 13, no. 9:13 (1934)), which describes the so-called Giller tower contructed for the Vischera plant in Russia. The sulphur dioxide reacts with milk of lime instead of lime stone as in the usual acid towers. Although certain deficiencies are connected with the use of this tower it is not influenced by the outside temperature and low grade limestone with a high magnesia content can be employed.—C. J. W.

Composition of Acid for Sulphite Pulping. O. K. Giller. Bumazhnaya Prom. 14, no. 2:5-12 (Feb. 1935); C. A. 29:5266.—In a preliminary paper the varied results of sulphite pulping are traced to such possible factors as the relative influences of calcium hydroxide, magnesium hydroxide and other bases in the cooking acid and the oxidizing effect of catalytic impurities in sulphur dioxide (pyrites) which affect the acid during storage and have an influence in cooking.—C. J. W.

Observations of the Formation of Sulphur Trioxide in Making Cooking Acid. Thorild Waern-Bugge. Svensk Pappers-Tidn. 38, No. 11:359-360, 365 (June 15, 1935).—Sulphur trioxide formation depends upon the oxygen content of the gas and the gas temperature before it enters the cooler. The burners should be operated in such a manner that a uniform temperature of approximately 1000° C. is maintaind before the coolers. The cooling process should proceed with the greatest possible speed. On account of the reducing action of the sulphur

dioxide dissolved in water the oxygen percentage should be kept as low as possible without causing sublimation. Temperature and gas analysis must be controlled continuously with accurate measuring instruments.—C. J. W.

The Two Stage Manufacture of Sulphite Pulp from Pine Wood with Sodium Sulphite Solutions. Erik Hägglund and Fritz Hedborg. Svensk Pappers-Tidn. 38, No. 10:318-321 (May 31, 1935).—A good yield of sulphite pulp with quite satisfactory strength properties can be obtained from quick growing pine wood cooked in two stages with sodium bisulphite and sulphurous acid. The method is, however, not suited for slow grown wood with large amounts of resin and pronounced heartwood formation; in this case black cooks are liable to occur before the wood is sufficiently disintegrated.—C. J. W.

Chemistry of Sulphite Pulping. XXX. Digesting Sulphite Pulp with Gaseous Acid. Erik Hägglund and Geijer. Svensk Pappers-Tidn. 38:41-43 (1935); C. A. 29:6051.—The much-discussed question of the action of recovered liquors on the digestion process was investigated experimentally. During digestion with such liquor under normal conditions neither the rapidity of the decomposition nor the quality of the cellulose is influenced unfavorably. Only when larger amounts of terpenes or cymene are present is the stability of the digesting acid endangered.—C. J. W.

Composition of Blow-Off Gases from the Manufacture of Sulphite Pulp. A. Krüger. Finnish Paper and and Timber J. 17, No. 2:58, 60-62 (Jan. 31, 1935).—This is a review of an article by Khodakov and Kallistratov, Bumazhnaya Prom. 13, No. 5:17-25 (1934)).—The waste gas consists of nitrogen, carbon dioxide and sulphur dioxide. The nitrogen is derived exclusively from the air in the chips. The amount of carbon dioxide liberated during the cook amounts to approximately 1.5 per cent of the weight of the pulp produced. Oxygen combines with the liquor to form calcium sulphate immediately after the digester is filled. Periodic relieving of the waste gas during the cooking procedure is an absolute necessity on account of the continuous carbon dioxide formation.—C. J. W.

Concerning the Present Technical Position of the Manufacture of Sulphite Pulp from Pine and Beech Woods. Hans Ress. Zellstofffaser 32, No. 7: 97-106 (July, 1935).—The amount of raw material available and general facts concerning pine wood and beech are discussed first. The various cooking processes are described in detail, using different bases such as ammonia, magnesia, sodium and lime for the cooking acid. In conclusion the author mentions certain problems which are yet to be worked out. Numerous references are included.—J. F. O.

Concerning the Importance of the High Calcium Oxide in the Cooking Liquor in the Sulphite Cooking Process. Erik Hägglund and H. Nihlen. Zellstoff Papier 15, No. 3:92-94; No. 4:137-39 (March, April, 1935).—A series of sulphite cooks are made and the results tabulated and plotted on curves. The following facts became evident: that with an increase in calcium oxide content, there was an increase in cooking time to obtain the same yield; the sugar content for a certain yield decrease linearly, to obtain a certain degree of cooking the yield increased; the bursting strength and the tensile strength increased markedly with only little influence on the tear, and the whiteness of the pulp increases.—J. F. O.

Production of Solutions of Alkali Metal Salts of Sulphurous Acid. Gustaf Haglund assignor to Patentaktiebolaget Gröndal-Ramen. U. S. pat. 2,010,077 (Aug. 6, 1935).—A solution containing an alkali metal sulphate (*e.g.*, obtained from spent pulping liquors) is treated with sulphur dioxide and one or more calcium compounds capable of reacting with sulphurous acid to form calcium bisulphite, until the alkali metal salts contained in the solution have been converted into bisulphite. The solution is then treated with one or more calcium compounds capable of reacting with bisulphite to form calcium monosulphite, until calcium salts in the solution are converted to monosulphite, the treatment being regulated to produce a solution substantially free from calcium salts.—A. P.-C.

Method and Means for Cleaning Sulphite Preheaters. Torsten Samson. U. S. pat. 2,008,839 (July 23, 1935).—Incrustations, which consist largely of gypsum, are removed by circulating through the heater a liquid which dissolves out the incrustations, *e.g.*, distilled water, ordinary water, with or without addition of sulphurous acid.—A. P.-C.

Method of Roasting Sulphide Ore. Horace Freeman assignor to Nicholas Engineering and Research Corporation of Canada, Ltd. U. S. pat. 2,002,496 (May 28, 1935).—This patent protects the flash-roasting of pyrites for the production of a gas suitable for the production of sulphite liquor. The dry and very finely pulverized ore is blown into a combustion chamber where the temperature is maintained above the range at which sulphur trioxide forms and below the melting point of the residue. The gases are cooled rapidly by scrubbing with water to remove any sulphur trioxide that may have formed, the water being raised to such a temperature that it retains practically no sulphur dioxide.—A. P.-C.

Apparatus for Separating Sulphurous Acid from Sulphite Waste Liquor. Karl Heinemann assignor to American Lurgi Corp. U. S. pat. 2,006,138 (June 25, 1935).—The invention provides an apparatus in which sulphite waste liquor is freed from sulphurous acid by means of a trickling system which consists of a series of spaced superposed rings and plates. The liquor is sprayed at the top and as it falls down the sulphur dioxide is liberated by the impact on the plates and removed through the central zone of the apparatus.—A. P.-C.

Indirect Heating and Circulating System for Sulphite Digesters. Harlan W. How. U. S. pat. 2,001,022, (May 14, 1935).—The digester is supported upon standards by means of brackets secured to the lower cone of the digester and having lower flat faces which are all in the same horizontal plane; this method of mounting permits of free expansion and contraction of the digester. The circulating system and heater are designed and constructed in such a way as to avoid strains in all stainless steel parts. Heating is effected by means of exhaust steam, which is passed through a thermo-compressor to increase its pressure and temperature. Steam is admitted to the heater through three branch pipes each having a thin-plate orifice, so that under suitable conditions the amount of steam delivered through each branch is constant. During the period of heating from atmospheric temperature to 100° C. steam is delivered through all three branches; when the temperature reaches 100° C., the steam valve is closed automatically in the branch having the largest orifice, and when maximum cooking temperature is reached the steam valve is closed automatically in the branch having the next largest orifice.—A. P.-C.

Method of Concentration Sulphite Waste Liquor. Clarence C. Hunicke and Charles L. Wagner. U. S. pat. 2,005,422 (June 18, 1935).—Hot flue gases are bubbled through a layer of sulphite waste liquor of definite depth, the gas bubbles being broken up to a predetermined size, as by a screen submerged in the liquor. The surface of the waste liquor is sprayed to maintain the predetermined

depth of liquid and to abate foam, and the liquor is recirculated till the desired degree of concentration is reached.—A. P. -C.

The Use of "Raylick B" As a Road Binder and Dust Palliative. Bernhard T. Winiecki. Pacific Pulp Paper Ind. 9, No. 7: 18 (July, 1935).—"Raylick B," produced by the Rainier Pulp and Paper Co., Shelton, Wash., is a concentrated sulphite waste liquor having an organic acidity of about one-fourth as strong as vinegar. Its application in road construction is briefly discussed—A. P. -C.

The Measurement of pH of Sulphite Waste Liquor with the Glass Electrode. Carl F. Leitz and Kenneth A. Kobe. Pacific Pulp Paper Ind. 9, No. 6: 10-13 (June, 1935).—A modified vacuum tube amplifying circuit of the ballistic type is described for measuring glass-electrode potentials with a potentiometer. It gives excellent results in sulphite waste liquor. When lime is added to sulphite waste liquor, up to pH 9.6 calcium sulphite is precipitated, and above pH 9.6 organic matter is precipitated. A pH of 9.6 is optimum for the precipitation of organic matter with ammonia.—A. P. -C.

Mechanical Process

Sampo Grindstone. Finnish Paper and Timber J. 17, special issue: 276 (April, 1935).—Sampo artificial grindstones, which are made at Woikka, Finland, are briefly described.—C. J. W.

Control of Operations in Canadian Paper Mills. K Saelan. Finnish Paper and Timber J. 17, no. 9:474, 476, 478, 480, 482-483 (May 15, 1935).—Description of the efficient control methods employed in the various departments of the Canadian newsprint mills.—C. J. W.

Wood Fiber Material in the Manufacture of Paper. F. Ruhlemann. Wochbl. Papierfabr. 66, No. 10: 181-188 (March 9, 1935).—The author first discusses briefly all the factors having a bearing on the quality of ground wood, and then describes the results interpreted from a dozen photomicrographs of various fibers after certain treatments. The different qualities of the paper made from the various fibers is next discussed, such as, the de-watering ability, feel, transparency, absorptive properties for different liquids, sizing, and the smoothness, gloss and appearance. The important effect of the very fine fibers and the cementing materials on the paper is shown along with tables of the results of the washing of ground wood for the removal of this fine fibrous material. Both flat washers and cylindrical washers are described.—J. F. O.

Grinding Wood for High Grade Newsprint Paper. Everett H. Strout. Paper Mills 58, No. 26: 9-11 (June 29, 1935).—A general discussion of the precautions required in the production of groundwood for high grade newsprint.—A. P. -C.

Grinding Pulp with Great Northern Grinders. George K. Walker. Paper Mill 58, No. 23: 33-39 (June 8, 1935).—An account of one year's operating experience with eight Great Northern grinders replacing 29 3-pocket, 24-in. grinders.—A. P. -C.

An Improved Pulpwood Grinder for Experimental Work. E. R. Schafer and J. C. Pew. Technical Association Papers 18: 144 (1935); Paper Trade J. 100, No. 25: 19 (June 20, 1935).—A description of a new experimental pulpwood grinder, designed for a production of approximately 2 tons per 24 hrs., now in process of manufacture for installation at the U. S. Forest Products Lab., Madison, Wis.—A. P. -C.

Method of Manufacture of Pulp. Arne J. A. Asplund assignor to Aktiebolaget Defibrator. U. S. pat. 2,008,892 (July 23, 1935).—Mechanical pulp is produced by subjecting wood chips to suitable mechanical action while they are subjected to an environment of steam or other gas or vapor at a temperature above 212° F. and sufficiently high to markedly soften the ligneous substance of the middle lamella.—A. P. -C.

Paper Pulp Grinding Machines. Frand Lord and Arnold C. Wilby. Brit. pat. 423,898 (Feb. 11, 1935).—In machines comprising a plurality of rotary disks mounted on a vertical shaft to act on the pulp in co-operation with stationary disks as the pulp passes between them, the inlet is arranged at the lower end of the machine and the pulp is forced upwardly and is ground between sheer-edged grinding blades provided only on the under sides of the rotary disks and the upper sides of the stationary disks, the grinding taking place only while the pulp is flowing outwardly from the shaft—A. P. -C.

Electric Feed Regulation for Wood Grinding Apparatus with Mechanical Movement of the Wood in Relation to the Load of the Grinder and the Feed Motors. Allgemeine Elektrizitats Gesellschaft, Berlin. Finn. pat. 16,151 (Oct. 28, 1927).—J. F. O.

A Study of the Color Principle in Western Hemlock Groundwood Pulp. C. E. Curran, E. R. Schafer and J. C. Pew. Paper Trade J. 101, No. 8: 35-41 (Aug. 22, 1935); Pulp Paper Can. 36: 373 (July, 1935).—Much of the color in the wood of western hemlock is caused by reddish inclusions present in the ray cells, and is probably a tannin or tannin derivative. The fine fibered portion of western hemlock groundwood contains more coloring matter than the coarser fibered portion, indicating that the cells containing the coloring matter are more highly disintegrated in the grinding process. Bisulphites and hydrosulphites are fairly effective in improving the color of the pulp. Certain oxidizing agents in alkaline solution, especially hydrogen peroxide, are more effective bleaching agents, but their commercial applicability is doubtful.—A. P. -C.

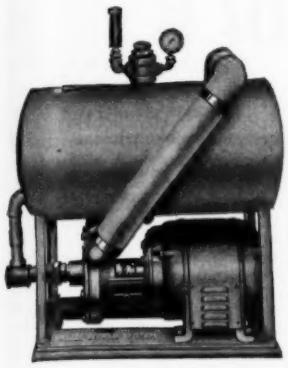
Miscellaneous Digesting Processes

Process for the Preparation of Cellulose by Means of Phenols. Papeterie 57: 494, 497 (June 10, 1935).—A brief description of the process of Ger. pat. 94,467 for pulping wood by heating to temperatures of up to about 210° in presence of phenolic compounds.—A. P. -C.

Oxidation of Wood with Nitric Acid. N. Ya Solechnik. Bumazhnaya Prom. 14, no. 4:30-37 (April, 1935); C. A. 29:5263.—Preliminary experiments in cooking aspen chips with 7 per cent nitric acid at 98° for 1.5 hours resulted in a 50 per cent yield of pulp; this treated with 0.05-25 per cent sodium hydroxide at 35-40° for 2 hours and bleached with 3 per cent active chlorine at 35-40° for 3 hours gave a pure white product with a viscosity of 125-140 millipoises and 0.07-0.13 per cent ash content, unbleached pulp. The spent liquor contained 10-13 per cent of pentose (calculated as pentosans), 4-6 per cent of volatile acids (calculated as acetic acid) and 3-4 per cent of Oxalic acid. Cooking with 3 per cent nitric acid at 98 per cent for 8 hours resulted in the consumption of 45 per cent nitric acid (on the weight of aspen chips) with 3.5 per cent of uncooked wood and 46.5 per cent yield of pulp with a copper number of 2.5, 0.065 per cent ash content and Sieber number 57, which after washing the pulp with dilute sodium hydroxide was reduced to 12-26. The spent liquor contains 9 per cent pentoses, 5.4 per cent volatile acid and 3 per cent oxalic acid; reworked with a large excess of hydrochloric acid or 4 per cent sulphuric acid, this gave a yield of 4.5 per cent furfural (on the weight of the chips used). The rate of formation of pentoses in the liquor proceeds with birch and spruce at a slower rate than in the similar decomposition of aspen.—C. J. W.

New Steam Return System

A revolutionary method of returning steam and condensate to the boiler at higher temperatures than ever before possible is said to be attracting the interest of steam plant owners and engineers. The equipment is manufactured and sold by the American District Steam Company, North Tonawanda, N. Y., east of the Mississippi River and by the Becker Pump Company, Oakland, Cal., in the western territory.



The installation of the ADSCO-Becker Condensate and Steam Return System in industrial plants, canneries, dairies, laundries, paper mills and for other processes operating steam consuming drying, cooking and heating equipment has increased production from 15 per cent to 40 per cent and effected fuel savings of from 15 per cent to 25 per cent, according to letters received from users of this apparatus. In addition, hotwells, feed pumps, injectors and other expensive accessory equipment and maintenance are eliminated.

The ADSCO-Becker Condensate and Steam Return System is a compact piece of equipment which is motor-driven, with one moving part. It is closed to the atmosphere from the boiler, through the steam using equipment and directly back to the boiler at any pressure and at temperatures ranging from 275 deg. to 350 deg., depending upon conditions.

Heat loss is reduced to a minimum; much less make-up water is required, boiler scale is materially reduced and boiler operation in general is improved. In some cases, present boiler pressures can be reduced by the ADSCO-Becker System and a further saving made in fuel costs.

Additional information is available by writing to ADSCO-Becker Pump Division of the American District Steam Company, North Tonawanda, N. Y.

New Heavy-Duty Fork Truck

A heavy-duty fork truck by the Elwell-Parker Electric Company, 4205 St. Clair Avenue, Cleveland, Ohio, designated as type ERX-6T, is typical of recent trends. This unit is capable of transporting, lifting and lowering 6,000-pound loads of materials of varying lengths, and develops a traveling speed of 525 feet per minute. Dynamic brakes on the drive motor are provided to electrically control the loaded truck descending a steep ramp.

Forks are built to specification according to the nature of the load. When used with the skid or pallet system, this type of truck greatly speeds the movement of goods through production or assembly, by setting down one load at a specified point—as opposite a given machine or bench—and picking up a waiting skid—or pallet-load for transportation to the next point.

Congestion is thus avoided in aisles at machines, narrow doorways and other crowded points; production flows more smoothly; and, with needless rehandling eliminated, transportation costs are greatly reduced. The basic requirements of successful power truck application are met, through moving goods safely; in greatest quantity; for the longest distances; in the least time and at the lowest cost.

At warehouse or storage, goods are delivered at full speed, still on skids or pallets and can be stacked or tiered up to the roof, if desired, by the same truck, with great economy of floor space. Frequently it is feasible to ship loads on pallets directly into motor truck, boxcar or marine vessel, and the same truck serves to handle goods to the final detail of outgoing delivery.

When tiering, loaded forks can be hoisted at the speed of 15 feet per minute, and lowered at a 28-foot rate. When empty, they travel at speeds of 28 feet up and 20 feet down. Regenerative braking on the hoisting mechanism when lowering returns current into the battery. Gas-electric unit is furnished when specified, and supplemented as an economy measure in reducing fuel consumption by the Elwell-Parker Throttle Control System.

Japanese Production of Transparent Cellulose Sheeting Shows Steady Increase

Japanese production of transparent cellulose sheeting has increased steadily since the inauguration of the industry about ten years ago, according to a report to the Commerce Department from its Tokyo office.

Although statistics covering output of this item have not been compiled, it is reliably estimated that production during the current year will amount to approximately 298,000 reams, which is double the total produced in 1932. Of the 1935 output, approximately 204,000 reams will be produced by five of the most important companies, the report states.

Exports from Japan of transparent cellulose sheeting in the first half of the year, official statistics show, amounted in value to 697,343 yen, the chief destinations being Shanghai, Hong Kong, India, Java and Australia. Corresonding data for 1934 are not available.

Transparent cellulose sheeting was imported into Japan for the first time in 1923, the first shipment coming from France. The following year imports increased to 6,600 tons valued at 30,000 yen and from then on trade in this item advanced progressively, reaching a total of 55,800 tons valued at 196,000 yen in 1930.

The first Japanese transparent sheeting was placed on the market in 1925, the earlier product being called artificial silk paper or glass paper by the Japanese manufacturers. An increasing number of companies began the manufacture of this product, resulting in keen competition and over-production. The best known brands of Japanese cellulose sheeting are now sold under the trade names of "Cellsy" and "Glyphane," according to the report.

"Sizing Up Size"

"Sizing Up Size," a highly technical 16 mm. industrial film, delving into the theories of paper sizing, is now being produced by the National Oil Products Company, Inc., Harrison, N. J. The picture, which is being directed and photographed by Arnold M. Hill, ACL, will feature the action that takes place when paper pulp is sized with rosin and wax size. A cinematic analysis of the method of preparation of this firm's paper size emphasizes the simplicity and quality of its product.

Since the main action is of such a nature that it is too small to be recorded through regular lenses, a high-powered microscope, working at about 1000 diameters magnification, will give the necessary enlargement to film this microscopic story. In order to obtain better definition, the work will entail the use of dark field illumination, using a strong arc lamp as the source of light.

When completed, the picture will be screened at technical paper meetings throughout the country.

IMPORTS OF PAPER AND PAPER STOCK

NEW YORK, BOSTON, PHILADELPHIA AND OTHER PORTS

NEW YORK IMPORTS

WEEK ENDING MARCH 7, 1936

CIGARETTE PAPER

R. J. Reynolds Tobacco Co., Pr. Harding, Havre, 50 cs.; R. J. Reynolds Tobacco Co., Washington, Havre, 150 cs.; Champagne Paper Corp., Washington, Havre, 45 cs.; Champagne Paper Corp., Champlain, Havre, 1,042 cs.; Standard Products Corp., Champlain, Havre, 24 cs.

WALL PAPER

F. J. Emmerich, Bremen, Bremen, 2 bls.; Phoenix Shipping Co., Bremen, Bremen, 2 cs.; F. Blank, Washington, Havre, 10 cs.; Titan Shipping Co., Bergensfjord, Oslo, 4 cs.

PAPER HANGINGS

W. H. S. Lloyd & Co., Alaunia, London, 3 bls., 1 cs.

NEWSPRINT

Jay Madden Corp., Pr. Harding, Hamburg, 226 rolls; Walker Goulard Plehn Co., Pr. Harding, Hamburg, 39 rolls; Bank of Montreal, Cornerbrook Pt., aux Basques, N. F., 1,549 rolls; N. Y. Evening Journal, Markland, Liverpool, N. S., 273 rolls; N. Y. Tribune, Markland, Liverpool, N. S., 1,604 rolls; World-Telegram, Markland, Liverpool, N. S., 636 rolls; Bridgeport Herald, Markland, Liverpool, N. S., 47 rolls; Brooklyn Daily Eagle, Markland, Liverpool, N. S., 80 rolls; Clinton Paper Corp., Markland, Liverpool, N. S., 241 rolls; Standard Star, Markland, Liverpool, N. S., 45 rolls; Jay Madden Corp., Deutschland, Bremen, 213 rolls; ———, Bergensfjord, Oslo, 198 rolls; Jay Madden Corp., Scanstates, Helsingfors, 665 rolls; Wilkinson Bros., Inc., Scanstates, Helsingfors, 83 rolls.

PRINTING PAPER

Diamond Match Co., Alaunia, London, 9 cs.; Japan Paper Co., American Banker, London, 1 cs.

WRAPPING PAPER

Yardley & Co., American Banker, London, 5 cs.; Steiner Paper Corp., Deutschland, Hamburg, 6 cs.

PACKING PAPER

———, Deutschland, Hamburg, 16 cs.

FILTER PAPER

H. Reeve Angel & Co., Inc., Berengaria, Southampton, 27 cs.; H. Reeve Angel & Co., Inc., Alaunia, London, 11 cs.

TRACING CLOTH

C. Bruning & Co., Inc., Bremen, Bremen, 27 cs.

METAL COATED PAPER

———, Pr. Harding, Hamburg, 6 cs.; K. Pauli Co., Deutschland, Hamburg, 24 cs.

SURFACE COATED PAPER

Gevaert Co. of America, Pennland, Antwerp, 71 cs.; ———, Deutschland, Bremen, 2 cs.; Globe Shipping Co., Deutschland, Bremen, 11 cs.

PHOTO PAPER

J. J. Gavin, Berengaria, Southampton, 6 cs.

BASIC PAPER

Globe Shipping Co., Bremen, Bremen, 8 cs.; Dingelstedt & Co., Pennland, Antwerp, 5 cs.

COLORED PAPER

D. C. Andrews & Co., Bremen, Bremen, 2 cs.; International F'd'g Co., Deutschland, Hamburg, 6 cs.

DECALCOMANIA PAPER

B. F. Drakenfeld & Co., Andania, Liverpool, 21 cs. (duplex); B. F. Drakenfeld & Co., Andania, Liverpool, 1 cs. (simplex).

DECALCOMANIAS

Sellers Transportation Co., Bremen, Bremen, 3 cs.; Sellers Transportation Co., Washington, Hamburg, 4 cs.

TRANSFER PICTURES

Rohner Gehrig & Co., Bremen, Bremen, 10 cs.

TISSUE PAPER

W. J. Byrnes, Berengaria, Southampton, 1 cs.

CARD BOARD

American Express Co., Washington, Hamburg, 111 cs.; Phoenix Shipping Co., Washington, Hamburg, 56 bls.

WOOD PULP PAPER

A. Giese & Son, Black Eagle, Rotterdam, 6 bls.

STRAW BOARD

———, Veendam, Rotterdam, 102 rolls.

MISCELLANEOUS PAPER

Iwai & Co., Narutu, Maru Kobe, 2 cs.; Keuffel & Esser Co., Pr. Harding, Hamburg, 4 cs., 102 rolls; Japan Paper Co., Tai Ping Yang, Kobe, 119 cs.; Wilkinson Grey & Co., Excambion, Genoa, 13 cs.; Hammel Riglander & Co., Champlain, Havre, 9 cs.; Coty Processing Co., Champlain, Havre, 17 cs.; A. Giese & Son, Champlain, Havre, 47 bls.; Japan Paper Co., Champlain, Havre, 13 cs.; F. L. Kramer & Co., Champlain, Havre, 3 cs.; American Express Co., Deutschland, Hamburg, 2 cs.

RAGS, BAGGING, ETC.

———, Pr. Harding, Hamburg, 60 bls. bagging; ———, Pr. Harding, Hamburg, 96 bls. rags; S. Birkenstein & Son, Pr. Harding, Havre, 50 bls. bagging; ———, Pr. Harding, Havre, 145 bls. bagging; Philadelphia National Bank, Pr. Harding, Havre, 93 bls. bagging; Chase National Bank, Pr. Harding, Havre, 36 bls. bagging; J. J. Ryan & Son, Inc., Wales, Maru Shanghai, 100 bls. cotton waste; Royal Manfg. Co., Wales, Maru Shanghai, 100 bls. cotton waste; Royal Manfg. Co., Wales, Maru Kobe, 50 bls. thread-waste; J. Levy & Son, Orizaba, Havana, 5 bls. rags; ———, Transylvania, Glasgow, 104 bls. bagging; J. Cohen

& Son, Inc., Andania, Liverpool, 15 bls. paper stock; ———, Andania, Liverpool, 60 bls. rags; G. W. Millar & Co., Inc., Veendam, Rotterdam, 66 bls. bagging; F. Stern, Veendam, Rotterdam, 198 bls. rags; ———, Veendam, Rotterdam, 71 bls. rags; E. J. Keller Co., Inc., Pennland, ———, 168 bls. bagging; Royal Manfg. Co., Pennland, Antwerp, 186 bls. cotton waste; Chase National Bank, Pennland, Antwerp, 235 bls. rags; E. J. Keller Co., Inc., Nordhavet, ———, 218 bls. rags; The Barrett Co., Nordhavet, Valencia, 43 bls. rags; ———, Nordhavet, Alicante, 40 bls. rags; Darmstadt Scott & Courtney, Nordhavet, Malaga, 70 bls. rags; ———, Nordhavet, Barcelona, 100 bls. cotton waste; ———, Nordhavet, Barcelona, 224 bls. rags; ———, Nordhavet, Barcelona, 34 bls. bagging; ———, Black Eagle, Rotterdam, 184 bls. pickers; R. Blank, Black Eagle, Rotterdam, 107 bls. rags; F. Stern, Black Eagle, Rotterdam, 72 bls. rags; Harris Goldman Co., Black Eagle, Rotterdam, 113 bls. bagging; Banco Coml. Italiane Trust Co., Black Eagle, Rotterdam, 142 bls. bagging; Philadelphia National Bank, Black Eagle, Rotterdam, 194 bls. rags; ———, Black Eagle, Antwerp, 177 bls. rags; E. J. Keller Co., Inc., Black Eagle, ———, 610 bls. rags; E. J. Keller Co., Inc., Black Eagle, ———, 248 bls. bagging; J. T. Flannery, Exermont, Casablanca, 90 bls. rags; Bank of N. Y. Trust Co., Exermont, Barcelona, 149 bls. old cottons; Bank of N. Y. Trust Co., Exermont, Barcelona, 37 bls. paper stock; ———, Exermont, Barcelona, 109 bls. bagging; ———, Exermont, Barcelona, 279 bls. rags; ———, Exermont, Barcelona, 68 bls. picker waste; ———, Exermont, Barcelona, 45 bls. old garments; ———, Exermont, Barcelona, 44 bls. cottons; Katzenstein & Keene, Inc., Exermont, Barcelona, 141 bls. old cottons; Katzenstein & Keene, Inc., Exermont, Barcelona, 8 bls. fustians, 99 bls. bagging; E. J. Keller Co., Inc., Exermont, ———, 189 bls. rags; Castle & Overton, Inc., Excambion, Alexandria, 138 bls. rags; Castle & Overton, Inc., Excambion, Alexandria, 75 bls. bagging; J. T. Flannery, Excambion, Alexandria, 57 bls. rags; W. Steck & Co., Excambion, Alexandria, 23 bls, rags; W. Steck & Co., Excambion, Alexandria, 92 bls. bagging; Banco Coml. Italiane Trust Co., Excambion, Alexandria, 66 bls. rags; E. J. Keller Co., Inc., Excambion, ———, 147 bls. rags; E. J. Keller Co., Inc., Excambion, ———, 54 bls. bagging; ———, American Banker, London, 84 bls. paper stock; ———, American Banker, London, 84 bls. old strings; Irving Trust Co., Black Gull, Antwerp, 112 bls. rags; E. Butterworth & Co., Inc., Black Gull, Antwerp, 140 bls. rags; Flintkote Co., Black Gull, Antwerp, 263 bls. rags; D. M. Hicks, Inc., Black Gull, Antwerp, 37 bls. flax pulp; Continental Bank Trust Co., Black Gull, Antwerp, 192 bls. bagging; S. Shapiro & Sons, Sagoporack, Gdynia, 72 bls. rags; ———, Washington, Hamburg, 126 bls. bagging; Continental Bank Trust Co., Scanstates, Gdynia, 75 bls. bagging.

Bone Glue

N. L. Lederer, Inc., Scanstates, Gdynia, 300 bags.

Old Rope

Banco Coml. Italiane Trust Co., Black Eagle, Rotterdam, 50 coils; Banco Coml. Italiane Trust Co., M. Arnus. Barcelona, 101 bls.; W. Steck & Co., M. Arnus, Barcelona, 114 bls.; Manufacturers Trust Co., American Banker, London, 56 coils; E. J. Keller Co., Inc., American Banker, ———, 131 coils.

Casein

Chase National Bank, Champlain, Havre, 333 bags; Kalbfleisch Corp., Eastern Prince, Buenos Ayres, 834 bags; Swift & Co., Eastern Prince, Buenos Ayres, 339 bags.

China Clay

Whitaker Clark & Daniels, Andania, Liverpool, 560 bags.

Wood Pulp

Gottesman & Co., Inc., Pr. Harding, Hamburg, 648 bls. wood pulp, 101 tons; Pagel Horton & Co., Inc., Bessa, Gefle, 750 bls. sulphite; Pagel Horton & Co., Inc., Bessa, Gefle, 1,000 bls. sulphate; Tradesmans Natl. Bank Trust Co., Bessa, Gefle, 375 bls. sulphate; Bulkley Dunton & Co., Bessa, ———, 4,625 bls. wood pulp; Stora Kopparberg Corp., Bessa, Skutskar, 1,530 bls. dry pulp; Price & Pierce, Ltd., Bessa, Iggesund, 3,000 bls. sulphite; Price & Pierce, Ltd., Bessa, Iggesund, 11,700 bls. sulphate; Pagel Horton & Co., Inc., Bessa, Iggesund, 150 bls. sulphite; Bank of Manhattan Co., Bessa, Iggesund, 1,650 bls. sulphite; Castle & Overton, Inc., Black Eagle, Rotterdam, 643 bls. wood pulp, 109 tons; J. Manheimer, Black Eagle, Rotterdam, 25 bls. wood pulp; Bulkley Dunton & Co., Black Eagle, Rotterdam, 1,300 bls. wood pulp; Lagerloef Trading Co., Sagoporack, Helsingfors, 2,237 bls. sulphate; Lagerloef Trading Co., Sagoporack Helsingfors, 317 bls. sulphite; Price & Pierce, Ltd., Sagoporack, Wallvik, 3,150 bls. sulphite; E. J. Keller Co., Inc., Sagoporack, ———, 336 bls. wood pulp; M. Sone, Washington, Hamburg, 1,177 bls. wood pulp; Johaneson Wales & Sparre, Inc., Washington, Hamburg, 1,673 bls. wood pulp, 250 tons; Central Hanover Bank Trust Co., Deutschland, Hamburg, 1,000 bls. wood pulp, 154 tons; Castle & Overton, Inc., Deutschland, Hamburg, 1,275 bls. wood pulp, 255 tons; ———, Deutschland, Hamburg, 282 bls. sulphate; Johaneson Wales & Sparre, Inc., Ditmar Koel, Sundsvall, 300 bls. sulphate, 50 tons; ———, Ditmar Koel, Hernosand, 1,225 bls. sulphate, 204 tons; ———, Ditmar Koel, Hernosand, 4,200 bls. sulphite, 663 tons; Perkins Goodwin & Co., Bergensfjord, Drammen, 250 bls. sulphite; Price & Pierce, Ltd., Bergensfjord, Oslo, 300 bls. sulphite; J. Andersen & Co., Bergensfjord, Oslo, 625 bls. sulphite; Bank of N. Y. Trust Co., Bergensfjord, Halden, 300 bls. sulphite; The Borregaard Co., Inc., Bergensfjord, Sarpsborg, 168 bls. sulphite; E. J. Keller Co., Inc., Scanstates, ———, 336 bls. wood pulp, 50 tons; Lagerloef Trading Co., Scanstates, Helsingfors, 265 bls. sulphite, 33 tons; Lagerloef Trading Co., Scanstates, Helsingfors, 156 bls. sulphate, 26 tons; Halifax Power & Pulp Co., Novasli, Sheet Harbor, 6,731 bls. ground pulp.

Wood Pulp Boards

———, Scanstates, Helsingfors, 490 rolls.

PORTLAND IMPORTS

Week Ending March 7, 1936

———, Ditmar Koel, Sandarne, 2,500 bls. sulphate, 500 tons; Johaneson Wales & Sparre, Inc., Ditmar Koel, Sundsvall, 180 bls. sulphite, 30 tons; Bulkley Dunton & Co., Ditmar Koel, ———, 2,500 bls. chemical pulp, 500 tons; ———, Ditmar Koel, Hernosand, 750 bls. sulphite, 125 tons; ———, Ditmar Koel, Hernosand, 3,750 bls. sulphate, 625 tons.

BOSTON IMPORTS

Week Ending March 7, 1936

———, Excambion, Alexandria, 45 bls. rags; E. J. Keller Co., Inc., Excambion, ———, 93 bls. rags; Halifax Power & Pulp Co., Novasli, Sheet Harbor, 3,329 bls. ground pulp; Perkins Goodwin & Co., Ditmar Koel, Sundsvall, 2,400 bls. sulphate, 400 tons; Johaneson Wales & Sparre, Inc., Ditmar Koel, Sundsvall, 180 bls. sulphate, 30 tons; Bulkley Dunton & Co., Ditmar Koel, ———, 900 bls. wood pulp, 150 tons; Bulkley Dunton & Co., Atna, ———, 150 bls. wood pulp; Parsons & Whittemore, Inc., Waukegan, ———, 1,850 bls. wood pulp; E. J. Keller Co., Inc., Waukegan, ———, 336 bls. wood pulp.

WILMINGTON IMPORTS

WEEK ENDING MARCH 7, 1936

Price & Pierce, Ltd., Bessa, Hernosand, 4,500 bls. sulphite; Brown Bros. Harriman & Co., Bessa, Hernosand, 3,978 bls. chemical pulp; ———, Bessa, Hernosand, 153 bls. chemical pulp; E. M. Sergeant Pulp & Chemical Co., Bessa, Hernosand, 3,000 bls. sulphite; Jay Madden Corp., Sagoporack, ———, 148 rolls newsprint; Lagerloef Trading Co., Sagoporack, ———, 3,040 bls. sulphite; Price & Pierce, Ltd., Sagoporack, ———, 3,000 bls. sulphate.

CAMDEN IMPORTS

WEEK ENDING MARCH 7, 1936

Price & Pierce, Ltd., Bessa, Wallvik, 3,000 bls. sulphate.

PHILADELPHIA IMPORTS

WEEK ENDING MARCH 7, 1936

Pagel Horton & Co., Inc., Bessa, Gefle, 2,330 bls. sulphate; Gottesman & Co., Inc., Bessa, Gefle, 1,500 bls. sulphite; Gottesman & Co., Inc., Bessa, Hernosand, 1,300 bls. sulphite; Gottesman & Co., Inc., Bessa, Hernosand, 1,000 bls. sulphate; Price & Pierce, Ltd., Bessa, Hernosand, 300 bls. sulphite; Pagel Horton & Co., Inc., Bessa, Hernosand, 6,160 bls. chemical pulp; ———, Bessa, Hernosand, 600 bls. sulphite; Stora Kopparberg Corp., Bessa, Skutskar, 2,060 bls. dry pulp; Darmstadt Scott & Courtney, Nordhavet, Barcelona, 853 bags glue stock; G. W. Millar & Co., Inc., Nordhavet, Barcelona, 103 bls. old cottons; Katzenstein & Keene, Inc., Exermont, Barcelona, 470 bls. old Cottons; Bank of Manhattan Co., Exermont, Marseilles, 97 bls. rags; E. J. Keller Co., Inc., Exermont, ———, 433 bls. rags; J. W. Hampton Jr. & Co., Sagoporack, ———, 412 rolls newsprint; Price & Pierce, Ltd., Sagoporack, ———, 6,600 bls. sulphite; N. L. Lederer, Inc., Scanstates, Gdynia, 100 bags bone glue; F. S. Cary & Co., Scanstates, Helsingfors, 825 bls. wood pulp, 165 tons; Lagerloef Trading Co., Scanstates, Helsingfors, 784 bls. wood pulp boards; Jay Madden Corp., Scanstates, Helsingfors, 187 rolls newsprint; J. W. Hampton Jr. Co., Scanstates, Helsingfors, 332 rolls newsprint; M. Sone, Liberty, Hamburg, 468 bls. wood pulp; Gottesman & Co., Inc., Waukegan Czecho-Slovakia, 648 bls. wood pulp; Bulkley Dunton & Co., Leerdam, ———, 234 bls. wood pulp; E. J. Keller Co., Inc., Narutu Maru, ———, 280 bls. paper stock.

BALTIMORE IMPORTS

WEEK ENDING MARCH 7, 1936

Castle & Overton, Inc., Black Eagle, Rotterdam, 2,243 bls. wood pulp, 393 tons; ———, Black Eagle, Rotterdam, 960 bls. wood pulp, 200 tons; Congoleum Nairn Co., Black Eagle, Rotterdam, 68 bls. rags; Congoleum Nairn Co., Black Eagle, Antwerp, 1,285 bls. rags; Congoleum Nairn Co., Exermont, Marseilles, 159 bls. rags; ———, Ditmar Koel, Sandarne, 4,125 bls. sulphate, 825 tons; Johaneson Wales & Sparre, Inc., Ditmar Koel, Sundsvall, 150 bls. sulphite, 25 tons; Johaneson Wales & Sparre, Inc., Ditmar Koel, Sundsvall, 1,125 bls. chemical pulp, 225 tons; Johaneson Wales & Sparre, Inc., Ditmar Koel, Sundsvall, 5,580 bls. sulphate, 930 tons; Bank of N. Y. Trust Co., Ditmar Koel, Hernosand, 2,100 bls. sulphate, 350 tons; Bank of Manhattan Co., Ditmar Koel, Hernosand, 1,800 bls. sulphate, 300 tons; Bank of Manhattan Co., Ditmar Koel, Hernosand, 600 bls. sulphite, 100 tons; ———, Ditmar Koel, Hernosand, 1,200 bls. sulphate, 200 tons; Bulkley Dunton & Co., Ditmar Koel, ———, 1,200 bls. sulphate, 200 tons.

NEWPORT NEWS IMPORTS

WEEK ENDING MARCH 7, 1936

Bulkley Dunton & Co., Fechenheim, ———, 1,750 bls. wood pulp.

JACKSONVILLE IMPORTS

WEEK ENDING MARCH 7, 1936

Bank of Montreal, Cornerbrook, Pt. aux Basques, N.F., 2,830 rolls newsprint.

TAMPA IMPORTS

WEEK ENDING MARCH 7, 1936

Bank of Montreal, Cornerbrook, Pt. aux Basques, N.F., 2,682 rolls newsprint.

NORFOLK IMPORTS

WEEK ENDING MARCH 7, 1936

———, Black Eagle, Rotterdam, 73 bls. bagging.

NEW ORLEANS IMPORTS

WEEK ENDING MARCH 7, 1936

M. Sone, Idarwald, Hamburg, 750 bls. wood pulp; Bank of Montreal, Cornerbrook, Pt. aux Basques, 3,429 rolls newsprint; ———, Ditmar Koel, Sandarne, 163 bls. sulphate, 33 tons; Bank of Manhattan Co., Ditmar Koel, Hernosand, 300 bls. sulphate, 50 tons; Times Publishing Co., Ditmar Koel, Sundsvall, 35 rolls newsprint; National Pulp & Paper Co., Inc., Ditmar Koel, Sundsvall, 350 rolls newsprint; Parsons & Whittemore, Inc., Ditmar Koel, Sundsvall, 40 rolls newsprint.

New German Casein Process

WASHINGTON, D. C., March 11, 1936—The use of pectin as a curdling agent for milk in the manufacture of casein is reported to have been satisfactorily developed in Germany, according to a report from Frankfort-on-Main, made public by the Commerce Department's Chemical Division. Pectin, it was stated, is the acid occuring in ripe fruits which gives their juices the property of jellifying.

In view of the growing industrial importance of casein, which is obtained from skimmed milk, particularly in the manufacture of glues, sizes, paints and plastics, and the recently developed Italian process for the production of synthetic wool from casein, a successful curdling agent has a promising field, the Commerce Department states.

Milk is curdled in industrial practice by the use of rennet, acids, or by boiling. The curd has, in each process, different properties, the rennet variety being the highest prized for certain purposes. The curd produced by the new German pectin process is stated to be superior to all those hitherto produced and to incorporate all the substances contained in skimmed milk.

Being one of the world's largest producers and consumers of casein, as well as pectin, the United States has a special interest in any improved processes for the manufacture of these products, C. C. Concannon, the Chief of the Commerce Department's Chemical Division states.

The United States' domestic output of casein in 1934, the latest period for which production figures are available, reach the high total of 37,330,000 pounds, it was stated, and was sufficient to satisfy about 96 per cent of our industry requirements during that year, the balance being imported, chiefly from Germany and the Argentine. Imports of casein in 1935 amounted to 3,230,000 pounds, almost half of the total being received during the last month of the year.

LATEST MARKET REVIEW

New York Market Review

Office of the PAPER TRADE JOURNAL,
Wednesday, March 11, 1936.

Conditions in the local paper market are gradually improving, with the approach of warmer weather. Demand for the various standard grades of paper is more persistent. Salesmen of the leading paper organizations are generally optimistic regarding the future. Prices remain unchanged, in most instances.

The newsprint paper market is in a slightly better position. Both advertising volume and circulations of the leading newspapers are running ahead of 1935 and manufacturing operations have been speeded up to take care of the increased demand. Stocks at the mills are not excessive.

Business in the fine paper market is holding up well. Demand for book, cover, bond and writing papers is fairly persistent. Tissues are in seasonal request. The kraft paper market is exhibiting a strong tendency. Demand for paper board is expanding and box board is moving in greater volume.

Mechanical Pulp

The ground wood pulp market continues moderately active. Production in the United States, Canada and abroad is practically keyed to capacity and the statistical position of the industry is considered satisfactory. The contract movement is normal for the season. Prices remain unchanged.

Chemical Pulp

Paper mill demand for the various grades of domestic and imported chemical pulp continues active. Kraft pulp is particularly strong and bleached sulphite pulp is displaying a firm undertone. The recently advanced price of bleached soda pulp is holding up well. Other grades of chemical pulp are steady.

Old Rope and Bagging

The old rope market is steady and unchanged. Demand for old manila rope is moderately active. Mixed strings are moving in fairly good volume for the season. The bagging market is quite active. Scrap and gunny bagging are going forward in good volume. Roofing bagging is firmer.

Rags

Demand for domestic paper making rags is better than for some time past. Both new and old cotton rags are moving more freely. No. 1 white shirt cuttings are in request in the United States, and abroad. Other grades of cotton rags are steady. Roofing grades continue to show improvement.

Waste Paper

Steadiness prevails in the paper stock market. Board mill demand for the lower grades of waste paper is more lively. Although collections are heavier now that weather conditions have improved, prices are holding to formerly quoted levels, in most instances. The higher grades of waste paper continue steady.

Twine

The local twine market is fairly active. Supplies are moving into consumption in good volume for the time of year. Demand for the various varieties should expand materially in the near future, with the advent of Springtime and warmer weather. No radical price changes have transpired.

Stainless Steel Valves

Aloyco Stainless Steel Valves were designed to provide the Chemical, Process and Food Industries with a line of extremely durable, low maintenance valves that would positively prove superior to ordinary types in the prevention of contamination and resistance to corrosion.

That Aloyco Valves have so successfully accomplished these objects is evidenced by the efficient service they are rendering today in sulphite mills, oil refineries, bleacheries, dye houses, and mines as well as in chemical, rayon, nitro-cellulose, ammonia oxidation and prepared food plants.

Where previously chemical valves of ordinary metals were clumsy and unduly heavy, Aloyco Valves avoiding unnecessary weight, are compact and rugged yet attractive in appearance. Where ordinary valves required constant care, expense and frequent renewals, Aloyco Valves are practically immune in most cases, to the action of corrosives and other agents. Special analyses are available for unusual or drastic applications. 1936 Aloyco catalogue is now available on request to the Alloy Steel Products Company.

Crown Willamette Makes Good Report

Report of Crown Willamette Paper Company and subsidiaries, including the Pacific Mills, Ltd., for the nine months ended January 31, 1936, shows net profit of $1,389,627, equivalent to $6.95 a share on 200,000 shares of $7 first preferred stock on which there is an accumulation of unpaid dividends. This compares with $1,104,829, or $5.52 a share on the first preferred for the nine months ended January 31, 1935.

For the quarter ended January 31, 1936, indicated net profit, based on comparison of reports for six and nine months, was $284,625, equal to $1.42 a share on the first preferred, against $607,074, or $3.03 a share on the first preferred in the preceding quarter, and $179,951, or 90 cents a share on the first preferred in the January quarter of 1935.

Miscellaneous Markets

Office of the PAPER TRADE JOURNAL,
Wednesday, March 11, 1936.

BLANC FIXE.—The position of the blanc fixe market is practically unchanged. Prices are holding to schedule. The pulp is quoted at $42.50 to $45 per ton, in bulk; while the powder is selling at 3½ to 3¾ cents per pound, in barrels, at works.

BLEACHING POWDER.—Steadiness prevails in the bleaching powder market. The contract movement is well up to average. Prices remain unchanged. Bleaching powder is quoted at $2 to $2.25 per 100 pounds, according to quantity, in drums, at works.

CASEIN.—The casein market is spotty. Domestic standard ground is now quoted at 14½ and finely ground at 15 cents. Argentine and French standard ground are selling at 14 and standard ground at 14¼ cents per pound, all in bags, car lot quantities.

CAUSTIC SODA.—Demand for caustic soda continues fairly persistent. Prices remain steady and unchanged. Solid caustic soda is quoted at $2.55 to $2.60; while the flake and ground are offered at $2.95 to $3 per 100 pounds, in drums, at works.

CHINA CLAY.—The china clay market is displaying strength. Contract shipments are moving freely. Imported china clay is quoted at $13.50 to $21 per ton, ship side; while domestic paper making clay is selling at $6.50 to $12 per ton, at mine.

CHLORINE.—The chlorine market continues firm. Demand from the paper mills is fairly active for the season. Prices are holding to schedule. Chlorine is quoted at $2.15 to $2.55 per 100 pounds, in tanks, or multi-unit cars, at works.

ROSIN.—The rosin market is easier. Paper making gum rosin is quoted at $4.45 and wood rosin at $4.25 per 280 pounds, gross weight, in barrels, at Savannah. Seventy per cent rosin size is selling at $2.58½ per 100 pounds, in tank cars, at works.

SALT CAKE.—Business in the salt cake market is moderately active. The contract movement is well up to average. Salt cake is quoted at $12 to $13; chrome salt cake at $11 to $12 per ton, at works. Imported salt cake is selling at $12 to $13 per ton, ship side.

SODA ASH.—The soda ash market continues firm. Demand from the paper mills is well sustained. Prices are steady. Quotations on soda ash, in car lots, at works, per 100 pounds, are as follows: in bulk, $1.05; in bags, $1.20; and in barrels, $1.50.

STARCH.—Conditions in the starch market are fairly satisfactory. The contract movement is normal. Prices remain unchanged. Special paper making starch is quoted at $3.10 per 100 pounds, in bags; and at $3.37 per 100 pounds, in barrels, at works.

SULPHATE OF ALUMINA.—The sulphate of alumina market is stronger. Prices are holding to formerly quoted levels without difficulty. Commercial grades are selling at $1.35 to $1.60 and iron free at $2.00 to $2.25 per 100 pounds, in bags, at works.

SULPHUR.—The sulphur market is steady. Yearly contracts are quoted at $18 per long ton, in bulk, on orders of 1,000 tons, or over, and at $20 per ton on any smaller quantity. On spot and nearby carloads, the quotation is $21 per ton. All prices are in car lots, at mine.

TALC.—Paper mill demand for talc is moderately active. The contract movement is seasonal. Prices remain unchanged. Domestic talc is quoted at $16 to $18 per ton, at eastern mines; while imported talc is offered at $23 to $30 per ton, on dock.

Market Quotations

Paper

Rag Content Bond & Ledgers—Delivered Zone 1

	Bonds	Ledgers
100% Rag Ext. No. 1	.36	.37
100% Rag	.28	.29
75% Rag	.21	.22
65% Rag	.18	.19
50% Rag	.15	.16
25% Rag	.12½	.13½

Sulphite Bond & Ledgers—Delivered Zone 1

	Bonds	Ledgers
No. 1 Sulphite	7.75	8.75
No. 2 Sulphite	6.75	7.75
No. 3 Sulphite	6.00	7.00
No. 4 Sulphite	5.50	6.50

Book, Cased—			
S. & S. C.	5.35	@	5.75
S. & S. C. Litho.	5.60	@	6.00
M. F.	5.10	@	5.50
Coated and Enamel	5.90	@	6.55
Coated Litho	5.90	@	6.55
Tissues—Per Ream—			
White No. 1	.82½	@	—
White No. 1 M. G.	.77½	@	—
White No. 1½	.62½	@	—
White No. 2	.60	@	—
Anti-Tarnish M. G.	.67½	@	—
Colored	.80	@	—
Kraft	.67½	@	—
Manila	.60	@	—
Unbleached Toilet	2.60	@	3.30
Bleached Toilet	3.94	@	5.26
Paper Towels—			
Unbleached	2.10	@	3.35
Bleached	3.30	@	3.70
Manila—			
No. 1 Jute	9.00	@	9.25
No. 2 Jute	7.75	@	8.50
No. 1 Wood	4.00	@	5.25
No. 2 Wood	3.50	@	4.00
Fibre Papers—			
No. 1 Fibre	4.25	@	5.50
No. 2 Fibre	4.00	@	4.75

(Delivered New York)

News, per ton—			
Roll, contract	41.00	@	—
Sheets	46.00	@	—
Kraft—			
No. 1 Northern	4.12½	@	4.75
Standard	4.00	@	—
Southern	3.87½	@	—
Boards—per ton—			
News	37.50	@	—
Chip	37.50	@	—
Sgl. Mla. Ll. Chip.	42.50	@	45.00
Jute Lined Chip	42.50	@	45.00
Kraft Liners	57.50	@	60.00
White Pat. Coated	55.00	@	57.50
Binders Boards	67.00	@	75.00

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	22.00	@	23.00
Dry	22.00	@	23.00

(F. o. b. Mill)

No. 1 Domestic and Canadian	18.00	@	24.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Division 1	2.60	@	2.90
Division 2	2.55	@	—*
Division 3	2.50	@	—*
Prime Qualities—			
Class 1. All Prime Easy Bleaching	2.05	@	—*
Other Than Easy Bleaching—			
Class 2. Higher than Standard	2.00	@	—*
Class 3. Standard	1.95	@	—*
Class 4. Lower than Standard	1.90	@	—*

(On Dock, Atlantic Ports)

Kraft No. 1	1.80	@	1.95
Kraft No. 2	1.65	@	1.75

(F. o. b. Pulp Mill)

Kraft Domestic	1.75	@	1.80

(Delivered)

Soda Bleached	2.60	@	—

* Add 60 Cents per short ton, dock charges, for Albany; $2.00 for Lake Ports East and $3.00 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	8.00	@	8.15
Silesias No. 1	5.50	@	5.75
New Unbleached	8.25	@	8.50
New Soft Blacks	3.75	@	4.00
Blue Overall	5.75	@	6.00
Fancy	3.25	@	3.50
Washables	2.25	@	2.50
Mixed Khaki Cuttings	3.25	@	3.50
O. D. Khaki Cuttings	4.00	@	4.25
Men's Corduroy	2.00	@	2.25
New Mixed Blacks	2.75	@	3.00

Old Rags

White, No. 1—			
Repacked	3.00	@	3.50
Miscellaneous	2.75	@	3.25
White, No. 2—			
Repacked	1.75	@	2.25
Miscellaneous	1.50	@	1.75
Thirds and Blues—			
Repacked	1.75	@	1.85
Miscellaneous	1.45	@	1.55
Roofing Rags—			
No. 1	2.25	@	2.35
No. 2	2.00	@	2.10
No. 3 (bagging)	1.85	@	1.95
No. 4	1.80	@	1.90
No. 5A	1.20	@	1.30

Foreign Rags

New Rags

New Dark Cuttings	2.00	@	2.25
New Mixed Cuttings	1.80	@	1.90
New Light Silesias	3.75	@	4.00
Light Flannelettes	4.25	@	4.50
New White Cuttings	6.50	@	7.00
New Light Oxfords	3.25	@	3.50
New Light Prints	2.75	@	3.00

Old Rags

No. 1 White Linens	7.50	@	8.00
No. 2 White Linens	6.50	@	7.00
No. 3 White Linens	4.50	@	5.00
No. 4 White Linens	2.25	@	2.50
No. 1 White Cotton	4.25	@	4.75
No. 2 White Cotton	3.25	@	3.75
No. 3 White Cotton	2.50	@	2.75
No. 4 White Cotton	1.90	@	2.15
Extra Light Prints	2.00	@	2.25
Ord. Light Prints	1.75	@	1.85
Med. Light Prints	1.55	@	1.65
Dutch Blue Cottons	2.00	@	2.25
French Blue Linens	2.30	@	2.40
German Blue Linens	2.15	@	2.25
German Blue Cottons	1.70	@	1.80
Checks and Blues	1.70	@	1.80
Linsey Garments	2.50	@	2.60
Dark Cottons	2.00	@	2.35
Old Shopperies	1.00	@	1.05
New Shopperies	1.25	@	1.35
French Blues	2.00	@	2.25

Old Rope and Bagging

(Prices to Mill f. o. b. N. Y.)

Gunny No. 1—			
Foreign	2.20	@	2.25
Domestic	2.25	@	2.35
Wool Tares, light	1.75	@	2.00
Wool Tares, heavy	2.25	@	2.35
Bright Bagging	1.75	@	1.80
Manila Rope—			
Foreign	2.40	@	2.50
Domestic	2.10	@	2.20
Mixed Strings	.85	@	1.00
New Burlap Cut	2.00	@	2.25
Hessian Jute Threads—			
Foreign	2.60	@	2.75
Domestic	2.80	@	3.00

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	2.65	@	2.75
Ordinary Hard White No. 1	2.25	@	2.35
Hard White No. 2	2.10	@	2.20
Soft White No. 1	2.05	@	2.15
Flat Stock—			
Stitchless	.65	@	.75
Over issue Mag	.65	@	.75
Solid Flat Book	.55	@	.60
Crumpled No. 1	.35	@	.40
Solid Book Ledger	1.50	@	1.65
Ledger Stock	.85	@	.90
New B. B. Chips	.30	@	.35
Manilas—			
New Env. Cut	1.75	@	1.85
New Cuttings	1.35	@	1.45
Bogus Wrapper	.40	@	.50
Old Kraft Machine—			
Compressed bales	1.25	@	1.35
News—			
No. 1 White News	1.45	@	1.50
Strictly Overissue	.50	@	.55
Strictly Folded	.40	@	.45
No. 1 Mixed Paper	.32½	@	.37½

PAPER TRADE JOURNAL

ESTABLISHED 1872

SIXTY-FOURTH YEAR

THE INTERNATIONAL WEEKLY OF THE PAPER AND PULP INDUSTRY AND THE PIONEER PUBLICATION IN ITS FIELD

Published Every Thursday by the LOCKWOOD TRADE JOURNAL CO., Inc.

GEO. S. MACDONALD, President — JOSEPH P. HORGAN, Secretary

Published at 34 No. Crystal St., East Stroudsburg, Pa.
Executive and Editorial Offices: 15 West 47th Street, New York
Chicago Office: 123 West Madison St.

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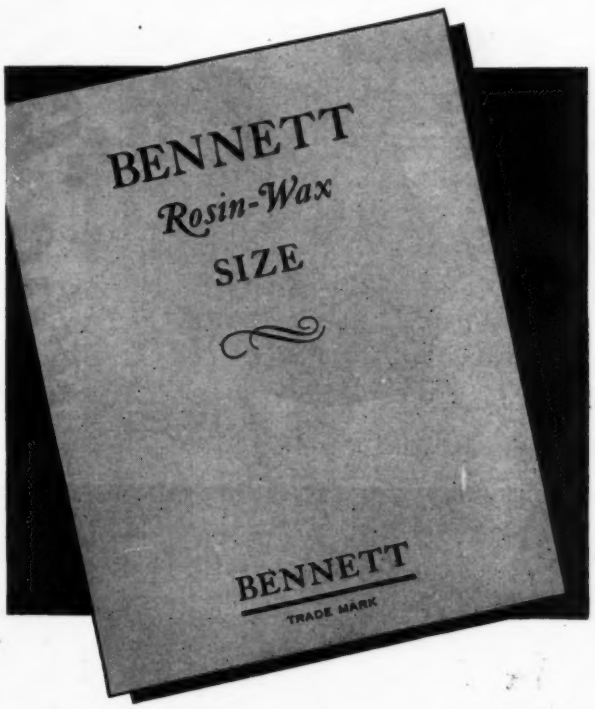

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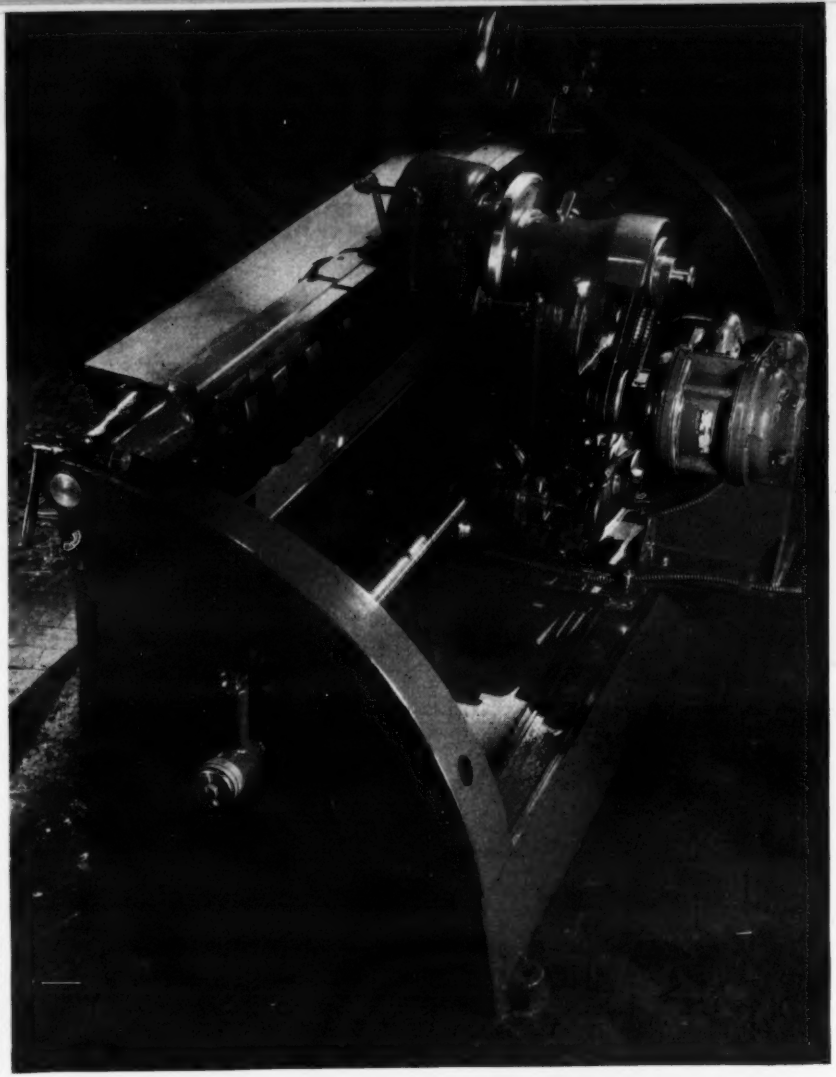

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